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Male Nurses' Experiences of Workplace Gender Discrimination and Sexual Harassment in South Korea: A Qualitative Study

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ABSTRACT (ENGLISH)

Purpose

The purpose of this study was to explore male nurses' experiences of workplace gender discrimination and sexual harassment in South Korea.

Methods

Phenomenological qualitative methodology exploring male nurses' experiences was employed to collect data, and thematic analysis of the data was conducted. Research subjects were recruited by convenience and snowball sampling. Ten male nurses participated in individual in-depth interviews via mobile phone. Data were collected from June 15 to July 24, 2020.

Findings

Two themes were extracted that described male nurses' experiences of workplace gender discrimination and sexual harassment. In the first theme, "facing gender discrimination from various dimensions," nurses' thoughts and feelings regarding gender discrimination from various sources were expressed. The second theme, "experiencing sexual harassment at work as a man," presented experiences of sexual harassment as a male nurse and difficulties in being recognized as a victim.

Conclusion

Gender discrimination and sexual harassment experienced by male nurses stem from a wide range of socio-cultural factors, ranging from individuals to organizations, and institutions. Therefore, this problem requires a correspondingly broad approach for improvement, such as making efforts to avoid classifying certain roles according to gender, developing new standards considering the specific experiences of men as victims of sexual discrimination and sexual harassment, and continuing training to increase social sensitivity and interest in the harm suffered by minorities in society.

FULL TEXT

Introduction

As the number of male nurses continues to increase worldwide [1–3], it can be predicted that male nurses will play a more important role in the healthcare field. According to the statistics of the Korean Nurses Association [4], the number of male nurses in South Korea (hereafter, Korea) increased by 6.5 times between 2009 and 2019. The proportion of male nurses among those who were newly licensed in 2019 was 13.8% [4], which is higher than the ratio of male nurses (9.4%) reported in the United States in 2020 [5]. Despite the steady increase in the number of male nurses, nursing is still a profession where women constitute the majority, and male nurses are still perceived as men who have chosen a nontraditional career [6]. As such, it has been reported that male nurses experience several stereotypes at work [7–9].

Previous studies on male nurses' work experiences found that male nurses experienced difficulty in establishing

comfortable relationships with female nurses, felt alienated [8], and experienced different expectations from those of female nurses [8,9]. Differences in work content, work environment, or job-related opportunities according to gender in healthcare institutions can lead to discrimination, and male nurses have also reported experiencing gender discrimination in the workplace [7,9,10]. Social expectations and prejudices toward male nurses can lead to negative results. In fact, some male nurses reported that they themselves were unclear about their future as hospital nurses [11], experienced gender role conflict in their workplace [12], and therefore considered job turnover [13].

Another issue that should be noted is male nurses' experiences of sexual harassment in the workplace. Most previous studies related to sexual harassment in the workplace have defined women as victims and men as perpetrators [14–19], and sexual harassment in the workplace has been defined as being perpetrated by a person with social power in a higher position [19]. Even based on the traditional definition of workplace sexual harassment, nursing is a women-dominated profession with more women leaders in power than men [8]. Therefore, the sexual harassment experiences of men as minorities in the nursing profession should be studied, and this issue should be managed as an important problem in the workplace. According to a previous study that was conducted in Korea, approximately 20% of nurses reported experiencing sexual harassment in the workplace [20]. The perpetrators of sexual harassment were mainly patients, and it should be noted that the proportion of male nurses who reported experiences of sexual harassment was about 38%, which was higher than that of female nurses [20]. In a study conducted in Australia, 34% of male nurses reported that they had experienced at least one type of sexual harassment in the workplace [21]. The number of male nurses who participated in both of those studies was small to generalize the research results [20,21], but the fact that this phenomenon continues to be relatively unnoticed because of the small number of male nurses creates a vicious circle that lowers the likelihood of these problems improving in the future. However, unfortunately, it was difficult to find a study examining sexual harassment experiences at work only among male nurses, although a previous study explored experiences of sexual harassment among male physicians in the United States and reported that experiences of sexual harassment were not uncommon among men, especially those working in healthcare [22]. Therefore, studies on reverse gender discrimination and sexual harassment experienced by men in female-dominant groups, especially in the healthcare field, should be dealt with in more depth.

Previous studies have provided valuable insights into the clinical experiences and barriers faced by male nurses in a female-dominated profession [6–8]. However, less research in the field of nursing has addressed workplace gender issues in depth, including sexual harassment within the socio-cultural context of masculinity and femininity. Therefore, this study explored various cases of gender discrimination and sexual harassment experienced by male nurses in the workplace through qualitative research and also explored male nurses' attitudes and possible ways to improve their work environment.

Research question

What is the nature of male nurses' experiences of workplace gender discrimination and sexual harassment?

Methods

This study was conducted using phenomenological qualitative methodology [23] and thematic analysis [24], which is a simple and flexible method, to understand the essence of the participants' experiences of workplace gender discrimination and sexual harassment as male nurses. In-depth interviews with semi-structured questions were used to guide the interviews. The reporting of this study complies with the consolidated criteria for reporting qualitative research (COREQ) recommendations [25].

Participants

The study participants were male nurses working at hospitals with more than 6 months of career experience. Ten individuals, who were able to voluntarily share their experiences after hearing about the aims of the study and the interview method, participated in the interviews (Table 1).

The sampling of male nurses was conducted based on convenience and snowball sampling method. Because the interviews were conducted by mobile phone (according to the quarantine guidelines of social distancing principles due to the coronavirus disease 2019 pandemic) [26], the researchers provided the research explanations and

consent form prior to the interview via email to the subjects who had stated their intention to participate in the study, and they were asked to fill out the consent form. After it was confirmed that a subject had submitted a written consent form for research participation, the researchers sent a concise questionnaire, which the subject was instructed to fill out and submit. The questionnaire contained questions eliciting information on the general characteristics of the research subjects and allowed the subject to select the desired time for an interview and to choose an online interview method (mobile phone or video call). All 10 nurses who participated in the study chose to be interviewed via mobile phone, with no video component.

Qualifications of the research team

One author is a woman, and the other is a man. Both the authors are PhD-level scientists and were working as professors at universities located in two different cities at the time of the study. Both authors who participated in this study are familiar and experienced with qualitative research methods. The authors attended a course on qualitative research methods during their graduate degree program. All of the interviews were conducted by the female author for neutrality in the interview process. The interviews were transcribed by two research assistants.

Data collection

For data collection, recruitment advertisements for research participants were posted on online communities and social media frequently accessed by nurses. In addition, male nurses were introduced through nurses known to the researchers, and snowball sampling was used in the next step. Data collection took place from June 15 to July 24, 2020. The study subjects did not have any prior personal relationship with the researcher. Therefore, the study subjects first contacted the researcher voluntarily through the researcher's mobile phone number presented in the recruitment notice, and the subjects who expressed their intention to participate were sent informed consent forms in the order that they replied. During this prepreparation process, the researcher who planned to conduct the interviews was able to judge the suitability of the research subjects and established a relationship with them through text messages and e-mails. Five male nurses expressed their intention to participate after seeing the recruitment notice, and 10 nurses expressed their intention to participate in the study through introductions from male nurses who had completed participation using the snowball sampling method. Consequently, a total of 15 male nurses expressed their intention to participate, of whom three answered that they had no experience of workplace gender discrimination or sexual harassment; therefore, they were excluded from the study. Subsequently, two nurses who expressed their intention to participate in the study did not proceed with the interviews because the research team decided that data saturation had been reached. As data collection and data analysis for each subject were conducted simultaneously, data saturation was confirmed based on a daily debriefing between the authors, and data collection was finished when no new information was generated from the interviews. Thus, data from 10 participants were finally included.

Information was collected on age, marital status, educational level, hospital location and nursing unit, position, career years, and type of shift through a simple questionnaire to investigate the sociodemographic characteristics of the subjects.

In-depth interviews were conducted by a researcher one-on-one at a time that participants preferred using mobile phones. The interviews lasted from 60 minutes to 120 minutes, and each participant was interviewed once. Since the interviews were conducted using mobile phones, nonverbal expressions could not be included. For compensating this, open-ended questions were used to encourage subjects to continue expressing the emotions related to their experiences, and the interviewer used active listening, paraphrasing, and reflecting skills during the interview process. Therefore, for some participants, the interviews took more time than would have been likely for face-to-face interviews. Field notes were taken by the researcher during the interviews. After the interviews, the subjects were informed of the possible need for an additional interview, and verbal consent was obtained. However, based on the interviews with 10 subjects, the authors did not find any new research questions related to the research topic that had to be added. All of the interviews were audio-recorded using a digital recorder. The questions for the participants' interviews used a semi-structured interview guide that was constructed through discussion among researchers and a literature review [3, 6, 8–10, 13, 27]. Before starting the interview, the definitions of

workplace gender discrimination and sexual harassment used in this study were explained to the study subjects, and they were asked if they had experience with this phenomenon and could speak frankly about their experiences. Subsequently, the participants were notified of the research topic and research questions before the interview, giving them sufficient time to consider the research topic. The main questions for the interview were: “Tell us about your experiences of gender discrimination and sexual harassment while working as a nurse,” “What are your feelings and thoughts about the experiences?“ and “How have you been dealing with gender discrimination or sexual harassment at work?”

At the end of the interview, the researchers checked once again whether the participants felt uncomfortable about participating in the study and whether they consented to data analysis and utilization. All 10 participants expressed their voluntary consent; therefore, there was no drop-out.

Data analysis

In this study, the subjects’ statements collected through in-depth interviews were analyzed through the thematic analysis method suggested by Braun and Clarke [[24]]. First, the transcribed data were read multiple times by the researchers to familiarize themselves with the content of the interviews. Second, initial codes were generated by finding 497 meaningful and interesting statements in the data. Third, 32 subthemes and 11 themes were formed by collating codes into potential themes. Fourth, the subthemes and themes were reviewed to check whether they worked in relation to the entire data set. Fifth, an ongoing analysis was conducted to refine the themes, which were finally named and defined. Finally, the report presented in the Findings section was produced. The data analysis process was conducted by two researchers at the same time, and the selected sentences, phrases, the classification process, and findings according to the categorization were reviewed. This process was continued until the researchers reached an agreement.

For ensuring the qualitative rigor of this study, the four criteria established by Lincoln and Guba [[28]] were used. For enhancing credibility, the analyzed data were returned to three participants, and their feedback was applied to the findings to confirm the reliability and accuracy of the analysis. Participants who had experienced workplace gender discrimination and sexual harassment were selected using snowball sampling to ensure transferability, and detailed descriptions with quotations were provided in the manuscript. Dependability was ensured by describing the study design and data collection process in detail. Before conducting each interview, the researchers conducted a reflective analysis to confirm that the process was proceeding as intended. All authors participated in the data analysis simultaneously and debriefed daily with each other to ensure confirmability.

Ethical considerations

This study was approved by the Institutional Review Board (IRB) of the institution where the first author was affiliated before data collection(Approval no. KYU-2020-053-01). This study was conducted in accordance with the principles of the Declaration of Helsinki and the guidelines provided by the IRB. Before starting each interview, the researcher informed the participant about the purpose of the study, the interview process, and plans for using the collected data. Written informed consent was submitted by e-mail or mobile phone, and the participant was informed that the interview would be recorded. Careful attention was paid to the collection of mobile phone numbers and e-mail addresses, as the survey and interview were conducted online. Additional consent was obtained for the collection of the above-mentioned personal information, and it was used only for conducting the interview and sending a gift as a reward for participation. In addition, participants’ contact information was kept in a separate file that only two researchers could check and was discarded after the reward coupon for participation was delivered to participants’ mobile phones. The interview content and transcripts were coded in a way that the subjects could not be identified.

Findings

This study analyzed male nurses’ experiences using the methods proposed by Braun and Clarke [[24]]. Based on meaningful statements, 12 codes, five subthemes, and two themes were identified ([Table 2]).

Theme 1: Facing gender discrimination from various dimensions

This theme contains three subthemes: “experiencing unfair treatment from nursing colleagues,” “burden of standing out as a ‘man’ rather than a ‘nurse’” and “institutional discrimination that makes male nurses think they cannot stay

longer."

This theme presents various types and dimensions of gender discrimination experienced by male nurses at their workplace. It was found that gender discrimination in the workplace occurred both from nursing colleagues and from patients and patients' families, who are the subjects of nursing. In addition, discrimination at the level of the organization and institution of the workplace to which male nurses belonged was confirmed.

Experiencing unfair treatment from nursing colleagues

This subtheme deals with unfair treatment and discrimination committed by nursing colleagues. Many nurses described being called upon when physical labor was needed for nursing tasks because their colleagues thought they would be strong due to being "men." A participant also described a situation wherein a female nurse was unable to work night shifts due to pregnancy or childbirth, and a male nurse was forced to work additional shifts rather than supplementing the workforce. Some of the participants stated that a bias was already present among nursing colleagues or nursing managers who expressed worries about whether male nurses would be able to adapt well. In other words, the nursing colleagues or nursing managers spoke as if they would give male nurses a fair chance, but their statements reflected their underlying perception that male nurses would not be able to adapt well. *"There seems to be a sense of masculinity. A sense that men should do the physical work?"* (Nurse 9)*"Because you are a man, you have good stamina. […] There was a time when there were multiple pregnancies (among nurses) in one ward, so we only had 6 days off during the month. […] There was almost no replacement personnel. […] I think I was on the night shift for 10 nights in a row."* (Nurse 8)*"In my opinion, people who have the wrong idea, those who basically think nursing is a female-majority field, those who are concerned about men. I think that concern itself is an undervaluation."* (Nurse 1)

Burden of standing out as a "man" rather than a "nurse"

The subtheme presents negative attitudes toward male nurses from patients or their families, who are the subjects of nursing care. In particular, male nurses were disappointed and frustrated when their patients refused to let them perform nursing care and asked to change to another nurse. Since male nurses are a minority compared to female nurses, they talked about the inconvenience of receiving unwanted attention due to their noticeable status. Additionally, the prejudice that men are generally slower, blunter, and less sensitive than women led to the idea that they would not be suitable as nurses.*"The patient was uncomfortable about being assigned a male nurse from the beginning and requested a switch …"*(Nurse 3)*"Just because I am male? I get noticed. Huh, a man? People looking at me like that, I feel a bit uncomfortable. I also thought, 'Am I doing something I shouldn't be doing?'"* (Nurse 1) *"People think men have slower hands. That they can be a bit blunt. They thought male nurses might not have good relationships with patients. They also think men cannot multitask well."* (Nurse 1)

Institutional discrimination that makes male nurses think they cannot stay longer

This subtheme addresses various types of discrimination that exist even within the institutions to which male nurses are affiliated. Many complained of the inconvenience of having to travel long distances to use the toilet or changing room due to the lack of facilities for male nurses. Male nurses also experienced limitations in providing nursing care to female patients. In addition, they stated that they were discriminated against in terms of vacation and welfare benefits in comparison with female employees. Female nurses receive menstrual leave, but male nurses find it even difficult to receive official leave for military duties.*"The structure of the ward and such facilities are built mainly for women because there have been more women in the past. For example, even bathrooms, mostly there aren't any male bathrooms for employees. So men, if they want to go to the bathroom, they have to go to the public bathroom outside of the ward. Changing rooms too, because there are few men, changing rooms for female nurses are all close to the ward, but the changing rooms for male nurses are isolated further away from the ward. This environment is not great."* (Nurse 5)*"For example, I know it differs across hospitals, but in this hospital, doctors put in the Foley for male patients. Same with CIC (clean intermittent catheterization). For female patients, nurses do it. It's not documented in the guidelines or regulations. But the work is distributed that way. This is a remnant of very long-held gender stereotypes."* (Nurse 4)*"At first, when I first started working, I don't know which ward, but there was a ward that explicitly said we don't need male nurses. […] For male nurses, it's a bit limited when putting a Foley in.*

Male nurses don't do it for female patients, but female nurses can do it for male patients. I think it's because of that. I heard other hospitals prefer female nurses for those reasons." (Nurse 9)*"When they make the work schedule, most women have menstrual cycle days protected by law. […] I first felt this was an issue. I need some scheduling accommodation for reserve forces training. It's not like I'm going on a personal trip. But the training schedules are not notified a month in advance. […] The schedule is notified two, three weeks in advance. I need to attend the reserve forces training because I was in the military where I served our country. But they got really angry and didn't understand this."* (Nurse 8)

Theme 2: Experiencing sexual harassment at work as a man

This theme contains two subthemes: "too subtle to say 'this is harassment'" and "finding it hard to be recognized as a victim."

This theme deals with subtle sexual harassment experienced by male nurses. Male nurses stated that it was an embarrassing and unpleasant experience but that it was too subtle to take issue with overtly.

Too subtle to say "this is harassment"

In this subtheme, the male nurses stated that after getting somewhat close with nurse colleagues, sometimes physical contact and sexually harassing remarks were made; however, it was difficult to recognize such behavior as sexual harassment at the moment, and it was even more difficult to take issue with it after a period of time. There was an additional explanation that it was difficult to distinguish whether or not the female nurses who made these sexually harassing behaviors and remarks had negative intentions. The harassment appeared in the form of intimate jokes, so male nurses had a hard time figuring out how to deal with it.

"Because we are somewhat close, they say it like a joke. They say it like that. Like a joke? But it's subtle …"(Nurse 1)

"One of the nurses, she was female, asked me how tall I was. […] I answered without thinking twice, but later I realized [the actual intent of the question] because other people told me. That's also sexual harassment. 'How did you meet your girlfriend?' Like that." (Nurse 6).

"I'm not sure if there are people who intentionally make harassing comments. So in that situation, when I hear those comments, when I start to think 'this feels a bit weird,' I was not able to say, 'don't do this.' I think it's a bit awkward." (Nurse 1)

Finding it hard to be recognized as a victim

This subtheme addresses the lack of awareness that men can also be victims of sexual harassment. The participants reported that there were many cases where words and actions perceived as sexist or sexual harassment were not perceived to be a problem when they were done by a female to a male. They also stated that due to the low overall awareness that men can be sexually harassed by women, even male nurses were often unaware of this possibility. It was pointed out that sexual harassment was permitted as an extension of gender discrimination because the perceptions and standards of sexual harassment differ between men and women and are ambiguous.*"For example, a patient putting a piece of fruit in my mouth. But even that, for example, when an older man says 'open up, I'll feed you a strawberry' to a young female nurse, some might be okay with that. I just went 'ah- ', but later when I thought about it, I had experienced sexual harassment."* (Nurse 8)*"For example, physical touch. Male nurses don't touch female nurses. This is just a social given. But it's very common for female nurses to pat male nurses on the shoulder or the back or the stomach. Because society does not define it as such, most of the time they don't recognize it as being sexually harassed."* (Nurse 2)

Discussion

This qualitative study explored gender discrimination and sexual harassment experienced by male nurses in the female-dominated nursing field. The phenomenological qualitative method enabled researchers to reveal the essential content and structure of male nurses' perceptions through in-depth interviews with 10 participants in Korea. Male nurses' gender discrimination was revealed to be primarily affected by three stakeholders: nursing colleagues, patients, and institutions. There were cases of receiving requests for help from nursing colleagues when they needed physical strength or being asked to work additional night shifts. Male nurses also stated that they felt

prejudices inherent against male nurses, although nursing colleagues disguised those prejudices in comforting and concerned words. Gedzyk-Nieman and Svoboda [29] conducted a study to discover attitudes of acceptance of male nurses using a survey on sexist attitudes and reported that female nurses had a lower acceptance toward male nurses than male nurses did [30]. Male nurses made efforts to work harmoniously with female nurses as colleagues, as has also been discussed in previous studies [7,8,31]. However, male nurses' feelings of not being accepted by female nurses seem to have continued for a long time [30]. In the findings of this study, male nurses felt that they were recognized as support personnel when there was a need for physical strength rather than being recognized as nursing colleagues by female nurses, which aligns with the results of those previous studies.

Furthermore, male nurses faced rejection by the patients they were taking care of simply because they were male and because the patients preferred female nurses. Choi and colleagues [32] likewise reported that male nurses experienced being rejected when attempting to provide nursing care, and other studies have also reported similar experiences in other countries [7,33]. Earlier studies have reported that patients preferred female nurses [34] or nurses of the same gender as themselves [35]. In connection with these findings, it should be noted that patients want to receive nursing care in a comfortable environment, and healthcare institutions are pursuing patient-centered care worldwide [36].

The phenomenon of female patients refusing to receive care from male nurses is linked to the findings found in this study that male nurses were occasionally regarded as "men" rather than as "nurses." This aligns with the other findings of this study regarding stereotypes about men and the stereotypical perception that nursing is a female job. Korea has been strongly influenced by Confucianism, in which the patriarchal system is deeply rooted, and men who choose jobs perceived as "females' jobs" tend to be stigmatized, and doing so is seen as taboo [37]. This social prejudice has also been reported as an issue in other Asian countries [38,39]. This cultural and social atmosphere can cause discomfort when female patients receive nursing care from male nurses. Conversely, when caring for female patients, male nurses may feel uncomfortable when they make contact with sensitive body parts, and this anxiety may interfere with the mindset of providing professional nursing care as a nurse. A previous study found that male nurses had been misunderstood as inappropriately touching female patients when unavoidable physical contact took place during the nursing process [32]. It is also possible that some patients may have legitimate reasons for preferring a same-gender nurse, including previous experiences of gender violence or sexual assault. In light of this atmosphere, the social perception that patients can choose the gender of their nurses raises doubts about nurses' professionalism and may cause role conflict for male nurses. This conflict can be further amplified when hospitals randomly divide the duties of doctors and nurses according to patients' gender. In fact, some of the subjects had been limited in the scope of work that they could perform, and there were also departments that male nurses could not be assigned to. This coping method can damage the social status and professionalism of nurses by arbitrarily limiting the role of nurses and may also constitute institutional gender discrimination. In addition, healthcare institutions should also handle this issue with great caution, as it may affect male nurses' opportunities for employment or promotion in the future.

Sexual harassment in the workplace has been defined as a hostile work environment involving threats to make employment-related decisions (e.g., hiring, promotion, or termination) on the basis of target compliance with requests for sexual favors or sex-related conduct that unreasonably interferes with an individual's work performance or creates an intimidating, hostile, or offensive working environment [16]. Sexual harassment has mainly been perpetrated by men toward female employees [15], and research has focused on female victims under this premise [14]. Workplace sexual harassment also has the characteristics of using position and power [17], and in the case of service workers, it includes cases where the customer engages in sexual harassment from a position of power [16]. In recent years, sexual harassment has been psychologically defined based on whether an individual feels harassed [16]. In this respect, it can be said that the social position of male nurses makes them highly likely to be victims of sexual harassment.

In traditionally male-centered societies, people may consider that women are victims of sexual harassment, and men may be perceived as potential perpetrators. In this study, the participants stated they perceived low levels of

sensitivity regarding male victimization. According to Raj, Johns, and Jose [40], men employed in male-dominated occupations were less likely to have experienced workplace sexual harassment and less likely to report harassment or assault by a supervisor. This means that male nurses, who belong to the female-led nursing profession, may be at an increased risk of sexual harassment. In fact, sexual harassment from nurse colleagues frequently involved taking advantage of close relationships and was done in a subtle and ambiguous manner that made it hard to avoid. The perception that men cannot be victims of sexual harassment may also explain the low level of sensitivity that male nurses reported regarding the sexual harassment they had experienced, to the point it can be said that they are in a vulnerable position to identify themselves as victims. These findings show that the characteristics of sexual harassment that men can experience may be different from those of sexual harassment against women. Therefore, it is necessary to elucidate the characteristics of sexual harassment directed toward male nurses through continuing research on their experiences, considering the specificity of the healthcare field, and preparing measures to deal with these issues appropriately.

There are several important lessons and suggestions that can be made based on this study. First, there should be various ways for male nurses to expand their voice as a way to prevent workplace gender discrimination and sexual harassment. This is in line with proposals for the influx and development of male nurses in existing studies [41,42]. To promote the influx of men into the nursing profession, Kane and colleagues [41] recommended the implementation of cognitive programs for gender bias within medical institutions, avoiding the use of gender terminology and stereotypes, and protocols for reporting gender inequality incidents. Brady and Sherrod [43] also recommended strategies to retain male nursing students in educational programs and proposed changes to programs traditionally designed for women. Efforts should be made to avoid classifying certain roles according to gender. Second, newly developed standards considering the specific experiences of men as victims of sexual discrimination and sexual harassment must be established through in-depth studies. A universal standard for both men and women in defining gender discrimination and sexual harassment should be established. Finally, continuing efforts and training should be made to increase social sensitivity and interest in the harm suffered by minorities in society. Both male and female nurses should be aware that they can become perpetrators or victims, even unintentionally.

Limitations

The study had several limitations. First, the geographical range of the study was confined to some districts of one country (South Korea), and most of the participants worked at tertiary hospitals located in the capital region. Therefore, it is necessary to conduct an extended study targeting male nurses working in a wider variety of environments and countries. Second, we did not include nonverbal messages from participants because all interviews were non-face-to-face due to the coronavirus disease 2019 pandemic.

Conclusion

This qualitative study explored experiences of gender discrimination and sexual harassment among male nurses currently working at hospitals in Korea. Male nurses experienced various stereotypes as members of a minority in a female-led profession and experienced gender discrimination by patients, nursing colleagues, and institutions. Sexual harassment in the workplace experienced by male nurses was attributed to a low level of sensitivity to the fact that men could be victims of sexual harassment. Sexual harassment of male nurses was mainly carried out by female nursing colleagues and patients.

In addition to efforts to recognize and understand the different experiences of men and women, increasing the number of male nurses and improving the overall development and treatment of nurses are expected to lead to improvements in the problems of gender discrimination and sexual harassment faced by male nurses.

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Conflict of interest

The authors have no conflict of interest to declare.

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Participant ID	Age (years)	Marital status	Education level	Hospital location	Number of beds	Nursing unit	Total clinical career	Shift type
1	28	Unmarried	Bachelor's degree	Capital region	>1,000	Surgical ward	2 years 11 months	3 shifts
2	31	Married	Bachelor's degree	Capital region	>1,000	Medical ward	7 years 1 months	3 shifts
3	26	Unmarried	Bachelor's degree	Capital region	>1,000	ICU†	9 months	3 shifts
4	32	Unmarried	Bachelor's degree	Capital region	>1,000	Surgical ICU†	7 years 2 months	3 shifts
5	31	Unmarried	Bachelor's degree	Capital region	>1,000	Medical ward	5 years	3 shifts
6	25	Unmarried	Bachelor's degree	Capital region	>1,000	ICU†	1 year	3 shifts
7	33	Unmarried	Bachelor's degree	Capital region	>1,000	Pediatric ICU†	8 years 6 months	3 shifts
8	35	Married	Bachelor's degree	Capital region	>1,000	Medical ward	11 years 1 months	3 shifts
9	26	Unmarried	Associate degree	Non-capital region	800–999	Medical ward	1 year 3 months	3 shifts
10	42	Unmarried	Associate degree	Non-capital region	100–249	ICU†	10 years 2 months	Night fixed

Themes	Subthemes	Codes
Facing gender discrimination from various dimensions	Experiencing unfair treatment from nursing colleagues	Feeling of being used mainly for physical work

Unpleasantness of hearing worries about male nurses' adaptability	Burden of standing out as a "man" rather than a "nurse"	Frustration from patients' refusal to allow them to provide care
Facing prejudices about men at work	Unpleasant interest from patients and patients' families	Institutional discrimination that makes male nurses think they cannot stay longer
Discomfort at work due to a lack of facilities	Feeling of not being regarded as a professional when internal regulations limit their work	Disappointment with unfair welfare and vacation regulations
Experiencing sexual harassment at work as a man	Too subtle to say "this is harassment"	Difficult to distinguish between intimacy and harassment
Regretting not having recognized harassment immediately	Finding it hard to be recognized as a victim	Hard to understand ambiguous definitions of sexual harassment between men and women

DETAILS

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Effects of Nurse Navigators During the Transition from Cancer Screening to the First Treatment Phase: A Systematic Review and Meta-analysis

Oh, Jiwon; Ahn, Sukhee

ABSTRACT (ENGLISH)

Purpose

Implementation of nurse navigators during cancer screening to the first treatment visit may facilitate early diagnosis

and treatment. This study aims to demonstrate the evidence of the effects of nurse navigators during cancer screening in the first treatment phase.

Methods

Eleven electronic databases were searched, including PubMed, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, Web of Science, ScienceDirect, PsycINFO, KoreaMed, KISS, RISS, and DBPIA. The final search was completed in August 2021. Two reviewers independently screened and selected studies, extracted data, and conducted a quality assessment. Data to evaluate the effects of nurse navigators was analyzed through meta-analysis and narrative summary. Subgroup analyses were performed.

Results

A total of 16 studies was included. With low to moderate quality of evidence, nurse navigators had favorable effects on improving the timeliness of care during screening during the first treatment visits (MD = 20.42, 95% CI = 8.74 to 32.10, p = .001). Additionally, 13.0% to 45.0% of nurse navigated patients were more likely to complete cancer care services, although insignificant effects were observed. Study participants from individual studies reported a high satisfaction to the nurse navigators. Subgroup analyses indicated that nurse navigators working as key members in multidisciplinary programs had the greatest effect on reducing waiting times.

Conclusion

Nurse navigators improve cancer patient outcomes by providing more timely care. Additionally, nurse navigators have the substantial potential to increase completion rates to cancer care services and patient satisfaction. For facilitating multidisciplinary care, the use of nurse navigators is highly recommended in the future.

FULL TEXT

Introduction

Through early screening and treatments, healthcare providers can now prevent and treat cancer significantly [1]. However, delay of treatment initiation and treatment refusals still remain worldwide. In the United States (U.S.), a significantly increased time before cancer treatment initiation was observed between 2004 to 2013, from a median of 21 days to 29 days [2]. Additionally, 8.7% of colorectal cancer patients in Taiwan did not undergo treatments within 4 months of diagnosis, and 28.4% of Korean patients newly diagnosed with lung cancer received no treatments until death [3,4]. Delaying or refusing treatment is counterintuitive, although most cancer patients have a higher survival rate when treated earlier and a greater survival chance upon receiving treatment [2–5]. Yet many cancer patients, voluntarily or involuntarily, choose to postpone or refuse treatments because of various individual barriers, such as unclear information on treatment benefits, fear of side effects, financial problems, or distrust issues/poor communication with healthcare providers [6].

For addressing patient barriers to utilizing healthcare services, a patient navigation program was developed [7]. Patient navigation in cancer care is defined as “specialized assistance for the community, patients, families, and caregivers to assist in overcoming barriers to receiving care and facilitating timely access to clinical services and resources” [8, p. 54]. The program implementation has shown promise in facilitating the timely use of cancer care services [9]. Patient navigation services provide personalized and practical assistance to overcome the barriers that each cancer patient faces. This ensures that patients undergo timely care and adhere to treatment plans [8]. For instance, direct counseling was offered to assist anxious patients seeking medical information in understanding the cancer treatment options. Appointments were arranged with reminders to facilitate follow-ups for patients not understanding the importance of timely treatment adherence, and cancer care coordination was provided to reduce the burdens of confusion for patients having difficulties navigating through multidisciplinary care systems [10]. As types and/or complexity of services vary, depending on each patient’s needs, patient navigation programs provide individualized care to cancer patients [8]. To achieve high-quality patient-centered care, the Commission on Cancer now requires the incorporation of a patient navigation process into the clinical cancer care system [11].

Within a cancer care continuum, the most essential phases to implement a patient navigation program are from screening, diagnosis, and the transition phase to first treatment. Throughout the movement across the span of the cancer care continuum, or transition, from screening to the first treatment phase, making a prompt decision to

receive medical care could greatly increase one's survival rate by early diagnosis and immediate treatments [2]. However, the research conducted at National Cancer Center, Korea, [5] reported 47.6% of untreated cancer patients refused treatments right after a cancer diagnosis. Additionally, 40% of the untreated patients did not involve healthcare providers during their treatment decision-making processes, implying a lack of informed decisions and professional support [5]. In recent studies, researchers discuss the need for having an adequate means of communication between cancer patients and the medical team because sufficient information and the attitudes of health professionals increase the likelihood of cancer patients receiving treatment [12]. For reducing treatment delays and refusal rates, patient navigation programs should be delivered during screening for the first treatment phase by patient navigators who have health professional backgrounds.

While all types of patient navigators are known to be beneficial, nurse navigators during screening for the first treatment phase may be of particular assistance, allowing patients to receive immediate cancer care and direct access to healthcare providers. Individuals with abnormal cancer screening and a new cancer diagnosis are known to become quite motivated to seek information and to be at great risk of psychological issues [13]. With profound clinical knowledge, nurse navigators can provide accurate medical information allowing immediate answers to patient questions and helping with doubts when making treatment decisions [10]. Nurse navigators are also proficient in offering psychosocial support, which can reduce the patients' emotional distress and anxiety [10]. Additionally, nurse navigators have close working relationships with other health professionals, which can facilitate communication between cancer patients and multidisciplinary healthcare providers [14].

In previous literature, a number of systematic reviews evaluated the effects of cancer patient navigation programs [9, 15, 16]. However, there was no systematic review that specifically focused on evaluating the nurse navigators' effects during cancer screening for the first treatment phase. Only one article systematically reviewed patient navigation programs implemented during screening for the first treatment phase, but the authors did not limit the types of navigators to nurses only [15]. There was another systematic review, which identified the effects of nurse navigators, but this study assessed these effects during the treatment phase only [16]. Therefore, the purpose of this systematic review and meta-analysis is to provide the most current evidence of the effects of nurse navigators on the timeliness of care, completion rates of cancer care services, and patient-reported outcomes during transitions from cancer screening to the first treatment phase within a cancer care continuum.

Methods Design

A systematic review and meta-analysis of studies reporting the effects of nurse navigators during the transition from cancer screening to the first treatment phase were conducted following the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) [17]. The Synthesis Without Meta-analysis (SWiM) guideline was also used to complement the PRISMA guideline [18].

Search strategy

The initial search was conducted by two reviewers using eleven electronic databases: PubMed, CINAHL, CENTRAL, EMBASE, Web of Science, ScienceDirect, PsycINFO, KoreaMed, KISS, RISS, and DBPIA. The search was finalized in August 2021. This study used a PICOT (population, intervention, comparison, outcome, and time) tool to formulate a research question and guide search strategy. The research question was "In adult clients who were positively screened for cancer or newly diagnosed with cancer (P), what is the effect of nurse navigators (I) on the timeliness of care, completion rates of cancer care services, and any patient-reported outcomes (O) compared to usual care (C) during transitions from cancer screening to the first treatment phase (T)?." The search strategy was built based on a combination of population and intervention from the PICOT question using a Boolean operator of "AND" between P and I. The basic search terms and search strategy used were ("neoplasm*" or "cancer*" or "tum*r*") AND ("patient navigat*" or "nurse navigat*" or "oncology nurse navigat*" or "nurse practitioner navigat*" or "oncology nurse practitioner navigat*" or "pivot nurs*" or "care coordinat*" or "cancer care coordinat*"). Subject headings (e.g., MeSH terms, CINAHL headings, Emtree, PsycINFO Thesaurus) for "Neoplasms" and "Patient Navigation" were also used accordingly. In three Korean databases (KISS, RISS, and DBPIA), corresponding Korean search terms were used. Table S1 shows the details of the search strategy used in each database. An

additional manual search was conducted by screening the references in key articles.

Inclusion criteria

The eligibility criteria for this study were as follows:

1. Participants: Adults aged 18 or over who were screened for cancer or newly diagnosed with cancer and who have not undergone any forms of cancer treatments.

2. Intervention: Patient navigation programs implemented solely by any type of nurses (e.g., registered nurses, certified oncology nurses, advanced nurse practitioners, etc.) during cancer screening for the first treatment phase. The programs facilitated in a combination form of nurses with other types of navigators, such as lay workers, community health workers, or social workers, were excluded.

3. Comparisons: Usual or standard care.

4. Outcomes: Studies evaluating the timeliness of care, completion rates of cancer care services, or any patient-reported outcomes (e.g., satisfaction level and any psychological outcomes) were included. The outcomes of timeliness of care and completion rates of cancer care services were regarded as primary outcomes, and any patient-reported outcomes were regarded as secondary outcomes. Only the outcomes reported during transitions from cancer screening to the first treatment phase or before treatment initiation were included.

Any eligible studies published in English or Korean after the years 1990 to 2021 were included. Randomized controlled trials, quasi-experimental studies, and cohort studies (either prospective or retrospective) were included in this review.

Study selection

Two reviewers independently screened and selected eligible studies. Initially, the reviewers screened the titles and abstracts to narrow down the potential studies that met the inclusion criteria. For the secondary screening, the reviewers obtained the full texts of the relevant studies to evaluate their eligibility. Any disagreements between reviewers were discussed and resolved by involving third parties.

Risk of bias assessment

Two reviewers independently evaluated the risk of bias for the selected studies, and any disagreements were resolved by involving third parties. Tools used for the evaluation were version 2 of the Cochrane Risk of Bias tool (RoB 2) [19] for randomized controlled trials (RCTs) and the Risk of Bias In Non-randomized Studies – of Interventions (ROBINS-I) for the non-RCTs [20].

Data extraction

Study details from the selected studies were independently extracted by reviewers, using the predetermined table developed by the author. The reviewers obtained characteristics of included studies by populations, intervention, comparisons, outcomes, and study designs. The extracted data were then organized, and additional study details were obtained based on a core set of outcomes, which was developed to promote consistency in measuring the impact of patient navigation programs [21–23]. To determine the effects of nurse navigators, the reviewers extracted quantitative data about the timeliness of care (primary outcome), completion rates of cancer care services (primary outcome), satisfaction level (secondary outcome), and psychological outcomes (secondary outcome). The outcome of the timeliness of care was categorized into four transition phases, which were (1) screening to the treatment phase; (2) screening to the diagnosis phase; (3) diagnosis to the treatment phase; and (4) first consultation to the treatment phase. The completion rates of cancer care services were also classified into two groups by cancer care services. They were (1) diagnostic resolution; and (2) treatment initiation. Based on the proposed metrics by Fiscella

et al [23], the outcomes of satisfaction level and psychological outcomes were separately grouped as patient-reported outcomes.

Synthesis

Meta-analysis was mainly used as a synthesis method. Quantitative outcomes that were synthesized into a meta-analysis were (1) timeliness of care; (2) completion rates of cancer care services; and (3) psychological outcomes. The data that was not synthesized into a meta-analysis, or satisfaction level, was presented as a narrative summary. Summarizing effect estimates, combining p-values, or vote-counting were not appropriate to synthesize the data of satisfaction level due to the absence of the reported outcomes of historical control groups.

For the meta-analysis, most effect sizes of continuous data were computed with means and standardized deviations (SD) using Comprehensive Meta-Analysis (CMA) software, Version 3. When the SD was not available, means and *p* -values were used. In studies that reported median and interquartile ranges (IQR), the outcomes were converted into mean and SD using a formula from Wan, Wang, Liu, &Tong [24]. Quantitative data from both RCTs and non-RCTs were calculated into unmatched formats to analyze the effect sizes. In a study that reported multiple measures that could be synthesized into one meta-analysis, we used a combined measure of effect for each outcome data. The reason for using this calculation for multiple outcomes within the same study was to avoid counting the same participants in one meta-analysis [25].

The raw difference in means (MD) and 95% confidence interval (CI) were used to measure the differences in the timeliness of care days between the intervention and control groups. MD was calculated because of its use of the same scale (interval days), allowing intuitive interpretation of the results. For any other outcomes reported with continuous data (e.g., psychological outcomes), corrected standardized mean difference with Hedges' *g* and 95% CI were calculated for analyses. The reason for using Hedges' *g* instead of Cohen's *d* was because of the small number of studies included in this meta-analysis [25]. For those outcomes reported with dichotomous data, we used a relative ratio (RR) for calculating effect sizes. A random-effect model was used for all meta-analyses, regardless of the degree of statistical heterogeneity among studies [25]. The reason for using this model was because of its substantial variations in study participants and details of interventions.

Heterogeneity assessment

For evaluating the statistical heterogeneity among studies, we used the Q value and I^2 index. Heterogeneity was considered to be low when the I^2 index was less than 25%, moderate if 50%, and high if greater than 75% [26]. For those meta-analyses of timeliness of care with high statistical heterogeneity, subgroup analyses were performed to further examine the causes of heterogeneity. A random-effect model was used for subgroup analyses. The heterogeneity of outcomes that were presented as a narrative summary was assessed visually using a table.

Publication bias assessment

Funnel plots were used to evaluate publication bias. Funnel plots of meta-analyses, which pooled three or more studies, were presented using CMA software, but the interpretation was not conducted because of the small number of studies included in each meta-analysis [27].

Certainty of evidence assessment

Two reviewers independently evaluated the certainty of the evidence for each outcome based on the GRADE approach, and any disagreements were resolved by involving third parties. Regardless of study designs, we initially rated the evidence as "high" certainty for all evaluated studies because of the use of the ROBINS-I tool for evaluating the risk of bias of non-RCTs [28]. The results were presented in a "summary of findings" table using GRADEpro GDT software.

Results

The reviewers initially identified 11,529 records through electronic database searches and two records by a manual search of key articles. After removing the duplicates, 7,689 studies remained. During the initial screening phase, 7,594 studies were removed, which left a total of 95 articles for a full-text screening to assess for eligibility. In the final meta-analysis, 16 studies were included [29–44]. Figure 1 shows the selection process for this study. The primary reasons for exclusion during full-text article screening were the implementation of intervention during other phases within the cancer care continuum, the use of non-nurse navigators, and the use of study designs that did not meet the inclusion criteria.

Results of risk of bias assessment

All 16 included studies, with three randomized controlled studies [36,38,41] and 13 nonrandomized controlled studies [29–35,37,39,40,42–44], were separately assessed for risk of bias using corresponding tools. Table 1 presents the summarized results of risk of bias (Summarized results of risk of bias for each study with reasons are shown in Table S2). The overall risk of bias for the three RCTs was low. Some concerns in risk of bias were found only in the randomization process domain in one study (33.3%) [41] due to unclear statements about allocation sequence concealment. An overall risk of bias for 13 non-RCTs was serious. Moderate risk of bias due to confounding was identified in most studies (76.9%) as potential confounding variables were appropriately controlled for. However, a serious risk of bias due to confounding was given in three studies (23.1%) [37,43,44], as the authors did not consider processing possible confounding variables during the design or analysis phases.

Characteristics of included studies

Table 1 presents the summarized characteristics of all 16 included studies (Full details of characteristics for each study are shown in Table S2). The studies were published between 2011 to 2021. Most researchers conducted their studies in North America, with ten studies in the United States [29,32–36,39,40,42,43], and three in Canada [30,31,44]. Studies from other countries included Korea (n = 2) [38,41] and Botswana (n = 1) [37]. Study designs varied by each study. There were three randomized controlled studies [36,38,41], nine retrospective cohort studies [29–31,34,35,37,40,42,44], two prospective cohort studies [39,43], and two pragmatic quality improvement trials [32,33].

Participants

Participants were grouped into three different transition phases within the cancer care continuum of screening for the first treatment visit. Four studies [29–31,40] included individuals at the screening to diagnosis and to the first treatment visit, which consisted of all transition phases that this study has targeted. Three other studies [36,43,44] focused on individuals at screening for the diagnosis phase. The remaining nine studies [32–35,37–39,41,42] included participants at diagnosis to the first treatment visit (Table 1).

Participants' cancer types also varied by each study. Types of cancer from included studies were as follows: breast cancer (n = 3) [30,39,44], colorectal cancer (n = 2) [36,43], lung cancer (n = 4) [29,31,33,40], gastric/gastrointestinal cancer (n = 2) [38,42], gynecologic cancer (n = 1) [37], and pancreatic cancer (n = 1) [34]. While most studies recruited individuals from a single cancer group, the remaining three studies [32,35,41] included participants from two different cancer groups in their research (Table 1).

Intervention

Most nurse navigators were implemented to streamline cancer care and to facilitate timely access to cancer diagnostic or treatment services. Most nurse navigators carried out similar tasks. Those tasks were (1) coordinating and managing cancer care flow (n = 10) [29–31,34,36–40,42]; (2) serving as a primary contact person (n = 10) [29,31–37,39,41]; (3) following up on patients to ensure the completion of appropriate cancer care (n = 4) [33,35,36,39]; (4) obtaining patient records and ensuring test results were available (n = 4) [30,36,37,43]; (5) assessing and resolving individualized barriers to receiving care (e.g., financial issues, lack of transportation, mistrust and/or miscommunication, beliefs,

fear, etc.) (n = 8) [32–36,39–41]; (6) providing educational information and psychosocial support (n = 8) [30,34–36,38,40,41,44], and 7) referring to or providing information about available resources (n = 2) [35,44].

One significant variation among the tasks of nurse navigators was the liaison role within multidisciplinary team members. In seven studies [29,31–33,37,42,43], the authors evaluated multidisciplinary team programs but identified nurse navigators as being the key members within the team who mainly worked to facilitate interprofessional communications [MDT (NN)]. In four other studies [30,35,40,44], the effects of nurse navigation programs were assessed, but the authors explicitly stated their navigators worked in collaboration with multidisciplinary healthcare providers [NN (MDT)]. In the remaining five studies [34,36,38,39,41], the authors solely analyzed the effects of nurse navigators, and the liaison role with other healthcare providers was not clearly stated (NN) (Table 1).

Other variations among nurse navigators depended on the type of nurses, the means of contacting study participants, clinical settings where the programs were carried out, and conceptual models that were based upon a few developed programs (Table 1).

Results of nurse navigators' effects

Table 2 shows the summary of findings for the primary (timeliness of care, completion rates of cancer care services) and secondary outcomes (patient-reported outcomes) of this study.

Timeliness of care (primary outcome)

Eleven studies [29–31,34–37,39,40,42,43] reported the timeliness of care as their major outcome. Individual data was measured by the number of days that participants took to access one care service to the next care service. Most studies reported two or more transition phases in one research. The interval days used to calculate the timeliness of care were retrieved from electronic health records or computerized databases.

Timeliness of care: from screening to the first treatment visit

Data from four studies [29–31,40] was combined in this meta-analysis. Nurse navigators improved the timeliness of care by reducing an average of 20.42 (95% CI = 8.74 to 32.10, p = .001) days between the date of receiving abnormal screening results to the first treatment visit, compared to the usual care. An evidence of a fairly high statistical heterogeneity was identified (I^2 index = 70.0%, p = .020) (Figure 2). There was low quality of evidence for this outcome due to the serious risk of confounding risk of bias and inconsistency (Table 2).

Timeliness of care: from screening to diagnosis

Six studies [29–31,36,40,43] were synthesized for this outcome category. The mean differences showed nurse navigated groups waited 30.15 days (95% CI = 11.97 to 48.32, p = .001) fewer than did the usual care groups during the screening to diagnosis phase. The I^2 index value indicated high statistical heterogeneity (I^2 index = 93.8%, p Figure 2). There was low quality of evidence for this outcome due to the serious risk of confounding risk of bias and inconsistency (Table 2).

Timeliness of care: from diagnosis to the first treatment visit

Six studies [29–31,37,39,42] were included in this meta-analysis. The difference in means indicated that nurse navigators reduced the number of interval days to 17.54 between the date of diagnosis to the first treatment visit (95% CI = 2.45 to 32.63, p = .023). A high I^2 index value was identified (I^2 index = 96.0%, p Figure 2). There was low quality of evidence for this outcome due to the serious risk of confounding risk of bias and inconsistency (Table 2).

Timeliness of care: from the first consultation to the first treatment visit

Data from two studies [34,35] with three different population groups were utilized in this meta-analysis. Among study participants who had their first consultation with healthcare providers in a tertiary referral cancer center, participants in the nurse navigated group waited fewer than 11.41 days until the time of their first cancer treatment visit compared to those in the control group (95% CI = 6.02 to 16.80, p 2 index = 8.0%, p = .337) (Figure 2). There was a

moderate quality of evidence for this outcome due to the serious risk of confounding risk of bias (Table 2).

Completion rates of cancer care services (primary outcome)

Six studies [32–34,36,40,43] reported participant completion rates of cancer care services. Individual data was measured as being the number of individuals or the proportion rates of participants who completed diagnostic testing or treatments. The researchers obtained the data from medical records.

Completion rates: diagnostic resolution

Three studies [36,40,43] were synthesized for this meta-analysis. The effect size of the risk ratio showed that 45.0% of individuals from the navigated group were more likely to complete diagnostic resolution as compared to the participants from the nonnavigated group. However, the effect size was statistically insignificant (95% CI = 0.94 to 2.25, p = .095). A high statistical heterogeneity had been observed (I^2 index = 91.2%, p Figure 2). There was low quality of evidence for this outcome due to the serious risk of confounding risk of bias and inconsistency (Table 2).

Completion rates: treatment initiation

In this meta-analysis, three studies [32–34] with four different population groups were included. The effect size of the risk ratio showed that 13.0% of the participants in the nurse navigated group was more likely to initiate cancer treatment as compared to those in the control group, but the effect size was not statistically significant (95% CI = 0.99 to 1.29, p = .057). The I^2 index value indicated high statistical heterogeneity (I^2 index = 94.5%, p Figure 2). There was very low quality of evidence for this outcome due to the serious risk of confounding risk of bias, inconsistency, and imprecision (Table 2).

Patient-reported outcomes (secondary outcome) Satisfaction level

Three studies measured patients' satisfaction level with the overall cancer care experience [35,39,41]. The results of the included studies were not pooled for meta-analysis as two of the studies [35,39] were not able to measure the satisfaction level of historical control groups. Only Kwon et al. [41] compared the patient survey outcomes between navigation and control groups, which reported a favorable outcome to the nurse navigators (Hedges' g = 0.07, 95% CI = −0.24 to 0.37, p = .669, 163 participants, RCT). Although the comparisons between intervention and control groups were not possible in the other two studies, the intervention group participants reported high mean scores in both studies of Koh et al. (4.52 ± 0.51, 32 participants) [39], and Gordils-Perez *et al.* (4.78 ± 0.38, 54 gynecologic cancer participants; 4.87 ± 0.32, 47 hematologic cancer participants) [35]. A total possible score was five in both studies. There was very low quality of evidence for this outcome due to the serious risk of confounding risk of bias and very serious risk of imprecision (Table 2).

Psychological outcomes

Three studies [38,41,44] evaluated psychological outcomes of resilience [38], uncertainty [38], anxiety [38,41,44], depression [41,44], and distress [41]. The effect size showed nurse navigators did not have a positive impact on patients' overall psychological outcomes, but the effect size was not statistically significant (Hedges' g = −0.12, 95% CI = −0.33 to 0.09, p = .246). A low statistical heterogeneity was observed (I^2 index = 0%, p = .675) (Figure 2). There was low quality of evidence for this overall psychological outcome due to the serious risk of confounding risk of bias and imprecision (Table 2).

Additional meta-analysis was performed to evaluate the differences between effect sizes for each psychological outcome by assuming the independence among study variables (Table S3). Each psychological outcome was reported in one study, except anxiety that was reported in two studies [38,41]. Only resilience (Hedges' g = 0.07, 95% CI = −0.31 to 0.46, p = .714) and uncertainty (Hedges' g = 0.06, 95% CI = −0.33 to 0.44, p = .775) favored nurse navigators, but the effect sizes were statistically insignificant.

Results of subgroup analysis by the cancer types and liaison role of nurse navigators

To find out the sources of heterogeneity among studies reporting three phases of timeliness of care (screening to the first treatment visit, screening to diagnosis, diagnosis to the first treatment visit), we conducted subgroup analyses by the cancer types of participants and three different levels of nurse navigators' liaison role within multidisciplinary team members [MDT (NN), NN (MDT), NN]. Table 3 presents the results of the subgroup analyses. The cancer types were effective during the phases of screening to the first treatment visit (Q_B = 4.98, p = .026), and diagnosis to the first treatment visit (Q_B = 122.69, p B = 3.91, p = .048) and screening to diagnosis (Q_B = 6.81, p = .033).

Although the level of nurse navigators' liaison role was not effective during the one remaining phase (diagnosis to the first treatment visit), a consistent pattern in size effects was observed by the level of nurse navigators' liaison role in all three evaluated phases. The greatest effect sizes were observed in the MDT (NN) groups during all three phases of screening to the first treatment visit (MD = 32.88, 95% CI = 15.46 to 50.30, p p = .017), and diagnosis to the first treatment visit (MD = 24.36, 95% CI = −8.40 to 57.12, p = .145), compared to the other two subgroups [NN (MDT), and NN]. Greater effect sizes were also found in the NN (MDT) groups during all evaluated phases of screening to diagnosis (MD = 7.09, 95% CI = 0.53 to 13.64, p = .034), and diagnosis to the first treatment visit (MD = 6.33, 95% CI = 2.02 to 10.65, p = .004), compared to the NN groups (Table 3).

Discussion

Our findings showed that nurse navigators successfully improved the timeliness of care between screening to the first treatment visit, screening to diagnosis, diagnosis to the first treatment visit, and first consultation to the first treatment visit. Nurse navigators also increased the completion rates of diagnostic and treatment cancer care services, but the effects were insignificant. In respect to patient-reported outcomes, cancer patients were highly satisfied with the overall cancer care they received with nurse navigators, although their psychological outcomes did not improve.

Similar findings were demonstrated in a recent systematic review [45] in respect to improved timeliness of care from diagnosis to treatment and completion rates of treatment initiation. Although Wu et al. (2021) [45] examined the effects of nurse-led case management, their search terms and included studies involved nurse navigators, as well, and stated *navigators* and *case managers* were often used interchangeably. As the nurse navigators in our study also performed the role of care coordination, patient education and follow-ups, and collaboration with multidisciplinary healthcare providers, which were the defined role of nurse case managers by Wu et al. (2021) [45], our study outcomes could be compared to the results of Wu et al. (2021) [45]. However, unlike the recent systematic review [45] that also included programs led by a combination of multiple providers (e.g., a care-management-model-based patient navigation program facilitated by a registered nurse, a dental hygienist, a social worker, a business administrator, and a promotora), our study outcomes were based on patient navigation programs facilitated by the nurses only, which add stronger evidence to the positive effects of nurses on cancer patients. In addition, Wu et al. (2021) [45] indicated limited types of cancer, mostly breast cancer, were included in their study, which might cause bias in intervention effectiveness. With six or more cancer types included in our systematic review and a demonstration of different size effects by cancer types using subgroup analysis, our study outcomes reinforce the evidence of nurse navigators' beneficial effects with more precise findings.

Whereas most of the included studies dealt with nurse navigators for facilitating timely access to cancer care services, our findings of low to moderate quality evidence showed that improved timeliness of care was clinically meaningful during all four phases of screening to the first treatment visit. In the United Kingdom, the National Health Services (NHS) England [46] is setting the target waiting time to be 62 days (2 months) between the time of a referral for suspected cancer until the first treatment visit, 28 days between the time of a referral for abnormal screening to

diagnostic testing visit, and 31 days between the time of the decision to treat until the first treatment visit. Reflecting on these NHS England waiting time targets, our study results of 20.42 days' reduction between screening to the first treatment visit, 30.15 days' reduction between screening to diagnosis, and 17.54 days reduction between diagnosis to the first treatment visit demonstrate that nurse navigators have a clinically significant potential to reduce about one third to full days of the nationally defined waiting times. The use of nurse navigators may be one of the key interventions to improve cancer outcomes by facilitating timely access.

Along with improved timeliness of care, our study findings demonstrated 13.0% to 45.0% increased completion rates of cancer diagnostic and treatment services in the nurse navigated group with very low to low quality of evidence. However, the effect sizes of both completion rates were statistically insignificant. Thus, the results can be interpreted as nurse navigators potentially having the ability to increase completion rates of cancer care services. Our study outcomes of increased completion rates, as well as the outcomes of shorter waiting times, suggest that nurse navigators can facilitate a higher proportion of individuals receiving early diagnosis and treatments if diagnosed with cancer. A possible explanation for the positive impact of nurse navigators may be explained by improved communication between healthcare providers and patients. In actual clinical practice, cancer treatment refusal rates were lower (48.5%) among untreated patients who had involved healthcare providers when making the decision to treat, compared to those who had made their own (69.0%) without healthcare providers [5]. Additionally, the researchers who identified treatment refusals in countries with universal health insurance strongly emphasize the need for adequate communication between healthcare providers and patients [3,4]. Sufficient communication will increase the likelihood of building trust between providers and patients and providing enough education about diagnosis and treatment options. Nurse navigators may play an important role in facilitating communication between cancer care providers and patients, thereby assisting in decision making to treat during the transition from screening to the first treatment phase.

Despite finding no remarkable effects on improved psychological outcomes, our included studies suggested a very low quality of evidence that study participants were highly satisfied with the nurse navigators. Our study findings were consistent with the results of previous meta-analyses in which cancer patients also expressed high satisfaction with the nurse navigators [16]. These results can be explained by the patient-centeredness characteristic of the service, which is to deliver individualized care for each cancer patient. Patient-centered care has been recognized as an essential feature of high-quality care since the Institute of Medicine reported *Crossing the Quality Chasm* in 2001 [47]. However, we are still at an early stage of integrating patient-centered care in the healthcare system for quality improvement. For example, the study conducted at Korea Institute for Health and Social Affairs reported that awareness of patient-centered care was increasing among Korean healthcare providers, but whether the value has been realized in clinical sites is not yet clear [48]. As the services provided by nurse navigators require the incorporation of patient-centered care, the spread of this program could mark a step forward towards fulfilling the value in real clinical settings, improving the quality of the cancer care system.

Our subgroup analysis results demonstrated that nurse navigators who worked as primary members in multidisciplinary team programs had the greatest effect on improving the timeliness of care during screening to the first treatment phase. These outstanding MDT (NN) size effects might be the consequence of nurse navigators working in multidisciplinary team programs in a more structured way with cooperative multidisciplinary healthcare providers, thus allowing efficient integration of interdisciplinary professionals. Additionally, nurse navigators who actively played a liaison role showed greater size effects than did the navigators who inactively played a liaison role during all evaluated phases. The greater effect of nurse navigators with an active liaison role suggests the importance of nurse navigators' role in facilitating multidisciplinary teamwork. The central role of nurse navigators

among multidisciplinary healthcare professionals has been well identified in a previous study [14]. The significance of the multidisciplinary cancer care model has been recognized by many healthcare providers, and the Commission on Cancer has recently announced new 2020 standards that incorporate multidisciplinary participation in cancer care [11]. Nurse navigators will be a valuable resource in upcoming multidisciplinary cancer care settings.

Limitations

A limitation in this study was that included studies lacked a rigorous design. Out of 16 included studies, 81.3% (13 studies) were non-RCTs, including eight before and after studies without control groups. According to Cuijpers, Weitz, Cristea, &Twisk [49], combining the results of prestudies and poststudies for meta-analysis might result in biased outcomes. However, the role of nurse navigators was newly emerging in the current healthcare system, and before studies and after studies constituted the main current literature about nurse navigators. Conducting this study was meaningful as the results suggest the potential and actual value of nurse navigators in the current cancer care system. In the future, additional meta-analysis should be performed with primary studies, including control groups.

Another limitation was the exclusion of the term *case management* within the search strategy. Despite the interchangeable use of *navigators* and *case managers* [45], the reason for not including *case management* in this study was because of the presence of distinct differentiation in the use of terms between patient navigation and case management [50]. Both concepts focused on providing needs-based care, although the historical context and some functions differed [50]. With the more recent introduction of patient navigation in the 1990s, compared to case management, which emerged from the early 1900s, this study attempted to explore the effects of nurse navigators by assuming the role of nurse navigators and case managers were dissimilar. However, as delineated in the results section, many of the tasks performed by nurse navigators overlapped with the role of nurse case managers. Thus, future studies may consider applying the term or concept of *case management* led by nurses when conducting a systematic review or other types of studies relevant to nurse navigators.

Last, despite the presence of nurse navigators' studies conducted in Europe or Asia [50], most included studies in this review were conducted in the United States and Canada. However, similar findings were also identified in relevant review articles. In a systematic review by Wu et al. (2021) [45], eight out of 11 included studies (72.7%) were conducted in the United States. Also, in a scoping review by Kelly et al. (2019) [50], 120 U.S. studies (75%) and 26 Canadian studies (16.3%) were included out of a total of 160 studies. The reasons might have been caused by the variations in patient navigation definitions and use of terms across countries due to different governing healthcare systems (e.g., US Medicare, universal healthcare), various ways of integrating patient navigation within each individual healthcare facility, and the original emergence of patient navigation in the US cancer care setting [50]. Further studies are recommended to devise a broad search strategy to include studies from more diverse countries.

Implications for nursing research and practice

This study provides baseline data on the effects of nurse navigators during the transitions from screening to the first treatment visit phase within the multidisciplinary cancer care system. Our study findings suggest the need for conducting primary research, with an additional focus on providing stronger evidence for the nurse navigators' role in resolving psychological distress. At the same time, this study offers an idea of how the role of nurse navigators should develop in a future multidisciplinary cancer care system. For practitioners, our results recommend the use of nurse navigators during the transition phase of cancer screening in the course of the first treatment visit to improve timeliness of care and to increase completion rates to care services. In addition, our subgroup analyses findings encourage clinicians to use nurse navigators in multidisciplinary cancer care settings. In a cancer care setting where implementing multidisciplinary team programs might yet be difficult, a beneficial effect could still be obtained by fostering nurse navigators to liaise actively with clinical nurses.

Conclusion

In short, very low to moderate quality evidence suggested nurse navigators were effective in reducing waiting times and in facilitating the utilization of cancer care services from the time of the screening phase to the first treatment visits. Moreover, very low quality of evidence demonstrated that nurse navigators might enhance the satisfaction level with cancer care services, which may lead to improved quality of cancer care. However, current nurse navigators have limitations in relieving psychological distress. Nurse navigators will play a significant role in multidisciplinary cancer care systems that link interdisciplinary professionals to derive the best patient outcomes. The involvement of nurse navigators may improve overall cancer outcomes and the quality of care by bridging the gaps currently caused by cancer care fragmentations. Further, rigorously designed studies are needed to evaluate the accurate and precise impact of nurse navigators.

Funding statement

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Ethical approval statement

Exemption was granted from ethics review (IRB No. 201711-SB-071-01).

Declaration of competing interest

No conflict of interest has been declared by the authors.

Appendix A Supplementary data

The following is the supplementary data to this article:**Multimedia component 1**Multimedia component 1

Appendix A Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anr.2021.10.001.

Characteristics	n (%)	Included Studies
Published year		
2011–2012	2 (12.5)	[39,41]
2013–2014	3 (18.7)	[29,30,36]
2015–2016	2 (12.5)	[38,40]
2017–2018	5 (31.3)	[31,35,37,42,44]
2019–2020	3 (18.7)	[32–34]
2021	1 (6.3)	[43]
Countries		
United States	10 (62.5)	[29,32–36,39,40,42,43]

Canada	3 (18.7)	[30,31,44]
Korea	2 (12.5)	[38,41]
Botswana	1 (6.3)	[37]
Study designs		
RCTs	3 (18.7)	[36,38,41]
Retrospective cohort studies	9 (56.3)	[29–31,34,35,37,40,42,44]
Prospective cohort studies	2 (12.5)	[39,43]
Pragmatic QI trials	2 (12.5)	[32,33]
Participants		
Cancer continuum transition phases		
Screening to the first treatment visit	4 (25.0)	[29–31,40]
Screening to diagnosis	3 (18.7)	[36,43,44]
Diagnosis to the first treatment visit	9 (56.3)	[32–35,37–39,41,42]
Types of cancer		
Breast cancer	3 (18.7)	[30,39,44]
Colorectal cancer	2 (12.5)	[36,43]
Lung cancer	4 (25.0)	[29,31,33,40]
Gastric/Gastrointestinal cancer	2 (12.5)	[38,42]
Gynecologic cancer	1 (6.3)	[37]
Pancreatic cancer	1 (6.3)	[34]
Combination of two cancer types	3 (18.7)	breast &lung [32], gynecologic &hematologic [35], gastric &breast [41]
Intervention		

Liaison role of nurse navigators		
MDT (NN)	7 (43.8)	[29,31–33,37,42,43]
NN (MDT)	4 (25.0)	[30,35,40,44]
NN	5 (31.2)	[34,36,38,39,41]
Types of nurses		
Advanced nurse practitioners	1 (6.3)	[29]
Certified oncology nurses RNs with oncology clinical experiences	10 (62.5)	[34–36,38–44]
Not specified	5 (31.2)	[30–33,37]
Contact methods		
Face-to-face meetings	2 (12.5)	[30,34]
Phone calls	2 (12.5)	[31,36]
Both	5 (31.2)	[32,35,38,41,44]
Not specified	7 (43.8)	[29,33,37,39,40,42,43]
Clinical settings		
General tertiary hospital	10 (62.5)	[29–31,34,37–39,41–43]
Specialized cancer center	5 (31.2)	[32,33,35,40,44]
Primary care clinics	1 (6.3)	[36]
Use of conceptual models		
Yes	4 (25.0)	[32,36,38,41]
No	12 (75.0)	[29–31,33–35,37,39,40,42–44]
Risk of Bias Assessment (n, tool)	Overall Results	Included Studies (results)
RCTs (3, RoB2)	Low	[36,38,41] (low)

non-RCTs (13, ROBINS-I)	Serious	[29–35,39,40,42] (low), [37,43,44] (serious)

Nurse Navigators for Individuals Transitioning from Cancer Screening to the First Treatment Phase					
Patient or population: Individuals transitioning from cancer screening to the first treatment phase					
Settings: Any healthcare settings					
Intervention: Nurse navigators					
Comparison: Usual care					
Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)
	Risk with usual care	Risk with nurse navigators			
Timeliness of care: screening to treatment	The mean timeliness of care: screening toreatment ranged from 59.83 to 126.00 days	MD20.42 days more (8.74 more to 32.10 more)	-	1130 (4 observational studies)	○○ LOW[a,b]
Timeliness of care: screening to diagnosis	The mean timeliness of care: screening to diagnosis ranged from 11.00 to 140.10 days	MD30.15 days more (11.97 more to 48.32 more)	-	1526 (1 RCT, 5 observational studies)	○○ LOW[a,b]
Timeliness of care: diagnosis to treatment	The mean timeliness of care: diagnosis to treatment ranged from 30.00 to 108.67 days	MD 17.54 days more (2.45 more to 32.63 more)	-	1083 (6 observational studies)	○○ LOW[a,b]
Timeliness of care: consultation to treatment	The mean timeliness of care: consultation to treatment ranged from 27.10 to 47.80 days	MD 11.41 days more (6.02 more to 16.80 more)	-	425 (2 observational studies)	○ MODERATE[a]

Completion rates: diagnostic resolution	444 per 1,000	643 per 1,000 (417 to 998)	RR 1.45 (0.94 to 2.25)	860 (1 RCT, 2 observational studies)	○○ LOW[a,b]
Completion rates: treatment initiation	838 per 1,000	947 per 1,000 (830 to 1,000)	RR 1.13 (0.99 to 1.29)	12584 (3 observational studies)	○○○ VERY LOW[a,b,c]
Satisfaction level PROs	One study had a small but insignificant effect on improving satisfaction level (Hedges' g = 0.07, 95% CI = −0.24 to 0.37). In the other two studies, the intervention group participants from both studies reported high satisfaction levels to the overall cancer care received.			296 (1 RCT, 2 observational studies)	○○○ VERY LOW[a,d,e]
Psychological outcomes		Hedges' g 0.12 lower (0.33 lower to 0.09 higher)	-	357 (2 RCTs, 1 observational study)	○○ LOW[a,d]

Timeliness of care	Subgroups		No. of studies	MD (95% CI), P-value	Heterogeneity	QB, df, P-value
From screening to the first treatment visit	Cancer types	Lung	3	25.83 (13.01, 38.65), <.001	Tau^2 = 53.61, Q = 3.33, p = .189, I^2 = 39.9%	4.98, 1, .026
Breast	1	9.83 (4.09, 15.57), .001	Tau^2 = 0, Q = 0, p = 1.000, I^2 = 0%	Liaison role	MDT (NN)	2
32.88 (15.46, 50.30), <.001	Tau^2 = 36.45, Q = 1.30, p = .255, I^2 = 22.8%	3.91, 1, .048	NN (MDT)	2	13.25 (4.56, 21.93), .003	Tau^2 = 22.75, Q = 2.18, p = .140, I^2 = 54.1%

From screening to diagnosis	Cancer types	Colorectal	2	56.91 (−61.76, 175.58), .347	Tau^2 = 7204.24, Q = 57.12, p < .001, I^2 = 98.2%	4.49, 2, .106
Lung	3	28.53 (4.62, 52.44), .019	Tau^2 = 359.13, Q = 11.73, p = .003, I^2 = 83.0%	Breast	1	4.67 (1.41, 7.92), .005
Tau^2 = 0, Q = 0, p = 1.000, I^2 = 0%	Liaison role	MDT (NN)	3	65.99 (11.66, 120.32), .017	Tau^2 = 2142.90, Q = 29.69, p < .001, I^2 = 93.3%	6.81, 2, .033
NN (MDT)	2	7.09 (0.53, 13.64), .034	Tau^2 = 14.29, Q = 2.36, p = .125, I^2 = 58%	NN	1	−2.90 (−15.10, 9.30), .641
Tau^2 = 0, Q = 0, p = 1.000, I^2 = 0%	From diagnosis to the first treatment visit	Cancer types	Gyne	1	65.33 (54.69, 75.98), <.001	Tau^2 = 0, Q = 0, p = 1.000, I^2 = 0%
122.69, 3, <.001	GI	1	27.78 (11.65, 43.91), .001	Tau^2 = 0, Q = 0, p = 1.000, I^2 = 0%	Breast	2
4.95 (2.04, 7.86), .001	Tau^2 = 0, Q = .72, p = .396, I^2 = 0%	Lung	2	2.19 (−6.34, 10.71), .615	Tau^2 = 0, Q = .05, p = .826, I^2 = 0%	Liaison role
MDT (NN)	4	24.36, (−8.40, 57.12), .145	Tau^2 = 1073.94, Q = 82.47, p < .001, I^2 = 96.4%	2.06, 2, .357	NN (MDT)	1

DETAILS

Subject:	Medical diagnosis; Patients; Communication; Cancer therapies; Health care; Intervention; Medical personnel; Clinical trials; Nurse practitioners; Oncology; Medical screening; Systematic review; Nurses; Meta-analysis; Bias; Patient satisfaction
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The Development and Validation of a Perceived Nursing Support Scale for Mothers of Preterm Infants

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ABSTRACT (ENGLISH)

SUMMARYPurpose

Many studies have maintained that nursing support is necessary and essential for mothers of preterm infants; however, the perceived nursing support for mothers of preterm infants has not been sufficiently measured. This study aimed to develop a perceived nursing support scale for mothers of preterm infants (PNSS-MP).

Methods

The preliminary items of the PNSS-MP were developed through a literature review and in-depth interviews with mothers of preterm infants. Content and face validities were assessed by experts and mothers of preterm infants. A pilot study was conducted to confirm the feasibility and comprehension of the scale. To validate the PNSS-MP, 223 mothers of preterm infants were surveyed. Exploratory factor analyses were performed to confirm construct validity. Convergent and discriminant validities were analyzed using a multitrait-multimethod (MTMM) matrix. Reliability was tested by calculating Cronbach’s α and performing split-half testing.

Results

The PNSS-MP consisted of 27 items and was categorized into five factors, explaining 65.3% of the total variance. The factors were named: “baby care support” (7 items), “mental care support” (6 items), “maternal role support” (6 items), “introducing resources support” (4 items), and “information delivery support” (4 items). The overall reliability of the scale was .95.

Conclusion

The PNSS-MP adequately reflected the neonatal intensive care unit (NICU) in South Korea. Additionally, the PNSS-MP proved relatively valid and reliable; therefore, it can be used to measure nursing support in the NICU.

FULL TEXT

Introduction Background

Advances in medical technology have led to improved health and care for premature infants [1]. However, these advances have increased the admission rate to the neonatal intensive care unit (NICU), causing a disconnection between mothers and their infants [2]. This disconnection often brings a crisis and conflict between family members

as the mother is unable to perform an appropriate maternal role [2,3]. Preterm infants are also at high risk for developmental delays and emotional-behavioral problems because they spend most of their time separated from their parents [4]. In addition, mothers experience negative emotions, such as anxiety, frustration, and stress, due to the uncertain prognosis of their children [2,3,5]. Therefore, mothers expect nurses to explain how the infant is treated and wish to spend more time with the infant [3].

In this situation, nursing support is helpful to mothers of infants [3,5]. Nursing support places emphasis on interactions with patients and encourages their participation [3]. A mother of a premature infant who obtains information about the treatment process of her baby is comforted and regains her self-esteem as a mother with nursing support [5,6]. In addition, appropriate nursing support is useful for forming an attachment with the baby and is effective in improving maternal efficacy [3,7]. Families have also expressed that nursing support is useful for family-centered care in challenging situations, such as inpatient neonatal intensive care [3].

Nursing support is a unique concept in the nursing discipline [8]. Many studies have consistently attempted to validate the concept and its effects since the 1980s [8–10]. Nursing support is generally divided into three categories: educational support, which refers to providing information on diseases to patients being nursed; emotional support, which entails expressing sympathy and interest to the patient being nursed; and physical support, which is the provision of support to help the patient recover [8–10]. As described above, the concept of support may differ slightly depending on the provider and patient [8]. Ultimately, it includes activities intended to elicit positive outcomes from the patient [9,10].

Nursing support is provided in various ways in a NICU. Educational support is mainly offered in South Korea, and in the context of preterm births, educational support involves the provision of information about babies using videos, workbooks, and other means [11–13]. This has yielded positive outcomes, such as reducing maternal parental stress and anxiety and improving confidence in parental infant care [11–13]. More diversified nursing support in various areas has been provided in other countries. Tangible support, such as breastfeeding and kangaroo care, has been provided to facilitate infant growth and improve the attachment between parents and infants [7,14]. Moreover, other forms of nursing support involved introducing social or environmental resources such as helpful community-based programs or peer support [15,16].

Numerous studies and experts have argued that nursing support is essential for mothers of preterm infants [3,5]. However, the nursing support perceived by mothers of preterm infants has been insufficiently measured. The Nurse Parent Support Tool (NPST) developed by Miles [17] has been used to measure nursing support provided to parents in South Korea. This scale measures the following types of nursing support for mothers with hospitalized children: emotional support, esteem support, caregiving support, and information support. However, this scale was developed on the premise that mothers care for the hospitalized child directly, and it does not reflect the feelings and needs of mothers of preterm infants who are completely separated from their babies. Additionally, a major limitation of this scale is that it has been used without sufficiently ensuring the reliability or validity of a translated version. Furthermore, the effects of the nursing support provided to the parents of the hospitalized child have been measured using physiological variables (e.g., blood pressure, pulse, and blood sugar) or psychological variables (e.g., depression, stress, and anxiety), rather than measuring nursing support directly [9,10,18].

Purpose

Therefore, this study aimed to develop and validate a perceived nursing support scale for mothers of preterm infants (PNSS-MP). Specifically, the first aim was to develop a PNSS-MP based on concept analysis. The second aim was to psychometrically validate the developed scale. It will be useful to identify the diversity and degree of nursing support provided to mothers. In addtion, the measurement of nursing support perceived by mothers of preterm infants can be used as evidence-based data that can provide best nursing support practices for mothers of preterm infants.

Methods Study design

This study employed a methodological design to develop and validate the PNSS-MP.

Scale development Conceptual framework

The confirmation of the conceptual framework and the configuration of the scale components were based on the results of a previous study [3]. This study analyzed the concept of nursing support perceived by mothers of preterm infants using a hybrid model. At the theoretical stage, 16 articles published in South Korea and other countries regarding nursing support related to mothers of preterm infants were analyzed. At the field stage, in-depth interviews were conducted with 10 mothers of preterm infants. In the analytical phase, the attributes of nursing support identified during the theoretical and fieldwork phases were compared and analyzed. As a result, the nursing support perceived by mothers of premature infants consisted of 4 themes, 10 attributes, and 31 indicators. “Professional care” and “emotional care for the baby” were identified as attributes of baby care support. “Information related to the disease,” “inpatient environment,” “baby’s daily hospital life,” and “mother-centered care” were identified as attributes of information delivery support. “Empathy for mothers” and “therapeutic communication with the mother” were identified as attributes of mental care support. Lastly, “providing a chance for the mother to take care of the baby” and “reinforcement of the maternal role” were identified as attributes of maternal role support.

Composition of preliminary items

In total, 41 item pools were developed based on the 10 attributes and 31 indicators derived from previous concept analysis studies [3]. Subsequently, duplicated and ambiguous interpretations and grammatically incorrect statements were eliminated after consultation and review by two nursing professors and one specialist in Korean literature. Thirty preliminary items were extracted using clear and simple sentences, with each item presenting a single concept.

This scale used a Likert scale, which is widely used for measuring support or satisfaction and can determine the number of response categories according to the investigated phenomena and study objectives. This study used a 5-point Likert scale (“strongly agree” = 5 points; “strongly disagree” = 1 point) with a neutral point (3 points) based on evidence that forced-choice scales can elicit biased responses [19].

Content validity

For expert validation, experts in maternal and pediatric nursing examined content validity twice. Face validity was examined with mothers of preterm infants.

First expert content validity

The first expert content validity test was conducted from September 20 to October 4, 2018. The 30 preliminary items were reviewed by five nurses who had worked for ten years or more at the NICU and five professors of pediatric nursing and women’s health nursing.

After explaining the objective of the study and the concept of nursing support to each expert, the experts were asked to review the relevance of the contents of each item to the purpose of the scale. The degree of validity was evaluated as “not related at all” (1 point), “not related and revision is needed” (2 points), “related but revision is somewhat needed” (3 points), and “very related and concise” (4 points). If modifications were suggested, opinions on how to modify the items were collected.

Based on the content validity of the expert group, item-content validity index (I-CVI), scale-content validity index/average (S-CVI/Ave), and scale-content validity index/universal agreement (S-CVI/UA) were calculated. Content validity was determined when S-CVI/Ave≥.90 and S-CVI/UA≥.80 [20].

The result of the first expert content validity test showed that I-CVI ranged between .90 and 1.0, S-CVI/Ave was .93, and S-CVI/UA was .90. Items were then constructed concisely based on the first expert content validity test. Moreover, ambiguous or inaccurate items were corrected. There was an opinion that many items measured multiple attributes, such as “the nurse gave me an appropriate assessment and guided me in improving my baby caring.” These items were, therefore, modified and separated. Finally, 34 preliminary items were identified.

Face validity

Face validity was assessed with five mothers of preterm infants who participated in the in-depth interviews in the concept analysis process. The interviews were conducted between October 15 and October 24, 2018. The results of the face validity test with the 34 items showed that the I-CVI ranged between .80 and 1.0, and the averages of the S-CVI/Ave and S-CVI/UA were .98 and .88, respectively. Regarding the items, “A nurse reacted immediately when my

baby cried" and "A nurse responded immediately when my baby's monitor alarm sounded," mothers said that it would be difficult for a nurse to provide immediate care because each nurse takes care of several infants at the same time. Therefore, the word "immediately" was removed. In addition, the item "A nurse informed me about peer groups of mothers of preterm infants" was supplemented with the explanatory terms "online communities" and "local meetings," as the term "peer group" is unfamiliar in South Korea. The item, "A nurse sympathized with feeling guilty and sorry for the baby," was deleted as it might have caused negative thoughts and feelings within the mothers. Considering the opinion that the item, "A nurse comforted me as I was having a hard time," was too abstract because no specific situation was described, we added "giving birth to a preterm infant" to the end of the item. Lastly, the item, "A nurse saw me babysitting and corrected me if necessary," was deleted because of the opinion that it overlaps with the feedback-related item. Finally, 32 items remained.

Second expert content validity test

Based on the 32 revised items resulting from the first expert content validity and face validity tests, three nurses from the NICU, three doctoral students of pediatric nursing, and five professors of pediatric nursing and women's health nursing conducted the second expert content validity test. The test was conducted from November 1 to November 14, 2018. The results confirmed that the I-CVI was between 0.8 and 1.0, S-CVI/Ave was .99, and S-CVI/UA was .97. One of the opinions expressed in the second expert validity test was that it would be necessary for nurses to inform mothers about physical and medical condition changes in their babies, such as increases and decreases in weight and the progression of jaundice. Therefore, one item, "A nurse explained my baby's physical changes in a way I could understand," was added. Similarly, "I was provided enough information needed to me" was said to be too abstract and could give a sense of encompassing the items of support for information delivery; therefore, it was revised to "A nurse provided a sufficient amount of information, according to my needs." Thirty-three items were identified at this stage.

Pilot test

Based on the 33 items that had been validated by experts, the objectives and an explanation of this study were posted on the preterm mother's online social networking service (SNS) from November 28 to December 1, 2018. The pilot study included 25 participants.

It took 2–13 min (mean = 6.4 min, standard deviation = 2.6 min) to complete the questionnaire, and the degree of item comprehension was 4.08 ± 0.7 points, the appropriateness of the questionnaire arrangement was 4.07 ± 0.64, and the appropriateness of the item lengths was 4.24 ± 0.78 points, which were measured on a five-point Likert scale. Cronbach's α for the preliminary survey was .96.

Meanwhile, eight mothers expressed that they had difficulty determining which nurse should be the focus of the survey because there were substantial differences in the competencies of the nurses. Therefore, an additional instruction of "Mark with 'V' the most relevant response, recalling the overall nursing support that you received from the nurses of the NICU during your baby's hospitalization," was added to the introduction section of the scale. The main survey was conducted with 33 items confirmed through this process.

Scale evaluation Setting and samples

The sample size was determined based on Devellis [19], who argued that 200 participants would be required for a stable scale evaluation if the number of items was 40 or fewer. In addition, based on evidence that 200 to 400 participants would be suitable for exploratory factor analyses (EFA) [21], 223 participants were recruited for this scale evaluation.

The participants in this study were limited to mothers with preterm infants who were admitted to the NICU. The specific selection criteria for the study participants were as follows: a) mothers who understood the purpose of this study and agreed to participate in it, b) mothers who gave birth to a baby of less than 37^{+0} gestational age, c) mothers of an infant without congenital malformations or genetic disorders, and d) mothers within a year of their delivery.

Data collection and ethical considerations

This study was approved by the Inje University Institutional Review Board (Approval no. 2017-11-006-003). The

purpose and procedures of the study were explained to the participants. It was also explained that the data would be treated anonymously and used solely for research purposes. Participants were notified that they could withdraw from the study without any repercussions. Participants voluntarily agreed to participate in the study and provided their informed consent before completing the questionnaires.

The survey was conducted between December 3 and February 28, 2019. Offline recruitment was requested through the nursing departments with NICUs in Busan and Ulsan. However, it was difficult to recruit participants directly because of the closed environment of the NICU and possible invasions of privacy of patients. Therefore, 23 mothers were conveniently sampled from the NICU of one hospital that agreed to the data collection request. Other participants were recruited through a preterm mothers' online SNS on the N portal site. An online gift card was provided to the participants following their completion of the survey. In this process, missing questions were reconfirmed, and no participants were excluded because of insufficient responses.

Evaluation of the scale

The collected data were analyzed for testing item analysis and construct validity, including EFA, convergent validity, and discriminant validity. In addition, criterion validity was based on the correlation between the finalized instruments and the Pediatric Family Satisfaction Questionnaire (PFSQ). The reliability was tested using Cronbach's alpha for internal consistency and first-second half split-half reliability of the data. IBM/SPSS Statistics for Windows (version 24.0; IBM Corp., Armonk, NY, USA) was used for the analyses.

Item analysis

For the item analysis, the mean, standard deviation, skewness, kurtosis, ceiling and floor effect, and corrected item-to-total correlation coefficient of each item were identified. The threshold of skewness was set to ±2, and kurtosis was set to ±10 [22]. The corrected item-to-total correlation coefficients were set between .30 and .80 [23]. The standards for the floor and ceiling effect were set to 25% [24]. If the items did not meet the above criteria, they were considered for deletion. Additionally, Cronbach's α, after item removal, was checked to confirm any items affecting the scale's reliability.

Exploratory factor analysis

Prior to the EFA, it was examined whether the collected data were suitable for EFA using Kaise-Meyer-Olkin (KMO) and Bartlett's test of sphericity. We checked whether the KMO value was .5 or higher and if the p-value of Bartlett's test of sphericity was lower than .05 [23].

Subsequently, principal component analysis using Varimax orthogonal rotation, which rotates the factor structure while maintaining the independence of the factors, was performed to understand the structure between the measured factors [25]. After that, it was checked whether the communality extraction value was .4 or more, the eigenvalue was ≥1.0 [26], and the range of the factor loading was .50 or more [25]. If these criteria were not met for certain items, they were considered for deletion.

Convergent and discriminant validity

A multitrait-multimethod matrix (MTMM) was used to determine convergent and discriminant validity for scale development. The convergent validity was considered satisfied when the correlation coefficient, which was corrected for overlap between the sub-factors to which item belongs, was more than .40 [27]. In addition, if the difference between the item-own and item-other subscale correlation was greater than two times the standard error of correlation coefficients, it was considered that the item's discriminant validity was established [27,28].

Criterion validity test

The Pediatric Family Satisfaction Questionnaire (PFSQ), which was developed by Budreau and Chase [29], and translated by Jeong and Kim [30], was used to test concurrent validity. The PFSQ was developed to measure the service satisfaction of inpatient children's families. It consists of three areas of satisfaction: 7 items for hospital services and accommodations, 12 items for nursing care, and 11 items for medical care. In the PFSQ, nursing care items included items regarding direct care for babies, such as, "Nursing care was caring and concerned" and "Nursing care checked the patient's condition closely." It also includes items regarding care provided to parents, such as, "Nursing care kept us informed" and "Nursing care answered our questions clearly." In this study, the

participants answered the nursing care items in PFSQ with the PNSS-MP to establish concurrent validity, with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). 'Nursing care' was chosen for establishing criterion validity as it is a broad concept involving nursing support [31]. Pearson correlation coefficients of items regarding nursing care and PNSS-MP were calculated.

Reliability test

The reliability of the PNSS-MP was tested using internal consistency reliability and split-half reliability. Cronbach's coefficient was calculated to confirm the internal consistency reliability. To check the split reliability, the items of this study were divided into the first part and the latter part, and the correlation coefficient between the scores of the two parts was calculated and tested using the Spearman-Brown formula and the Guttman split-half coefficient.

Results General characteristics of participants

The general characteristics of the participants are presented in Table 1. The participants' mean age was 33.10 ± 4.08, and 156 (70%) had a bachelor's degree. The average monthly household income was KRW 3–4 million (28.3%). Most participants did not identify with a religion (47.5%). Mothers with their first child as a preterm infant were the most common (60.1%). The mean gestational age was 31.14 ± 3.23 weeks, and the mean birth weight was 1643.81 ± 623.55 gm. The mean length of hospitalization was 1.72 ± 0.96 months, and the mean age of the infants at the time of the survey was 5.61 ± 3.45 months.

Item analysis

The mean, standard deviation, skewness, and kurtosis of each item (33 items in total) were reviewed for the item analysis. The skewness value ranged from −0.66 to 1.70, and the kurtosis value was between −0.04 and 3.46, meeting the normality criteria. The item-total correlation coefficient for each item was between .37 and .78, which satisfied the standard (absolute value ≥ .30) [23]. Moreover, the changes in Cronbach's α were examined when an item was removed, and it was confirmed that no item affected the overall reliability.

Construct validity Exploratory factor analysis

As the previous study divided nursing support into four components [3], this study designated four factors in the first factor analysis. The results of the first factor analysis showed that the total explained variance was 59.4%, the communality was between .41 and .75, and the factor loading was between .45 and .86.

After confirming that the total explained variance was relatively low when the number of factors was specified, a secondary factor analysis was conducted without specifying the number of factors. The secondary factor analysis extracted five factors and increased the total explained variance to 62.9%. The communality was between .44 and .78, and the factor loading was between .41 and .86. Item 8, "A nurse explained my baby's physical changes in a way I could understand," and item 11, "A nurse told me things about my baby's daily life that I could not observe," were deleted because their factors could not be distinguished clearly.

In the third factor analysis, five factors were extracted, and the cumulative explained variance was 64.1%. It was confirmed that the communality was between .45 and .78, and the factor loading was between .46 and .86. Item 27, "A nurse told me a story that encouraged me and told me that my baby was doing well," was deleted because it was not a universal item that could be applied to all mothers of preterm infants and its factor classification was unclear. Item 33, "A nurse helped me make the best decisions for baby-related matters," was deleted because classifying the factor was difficult.

Based on the above, a fourth factor analysis was performed, and five factors were extracted. The total explained variance was 64.3%. The communality was between .46 and .79, and the factor loading was between .43 and .88. Regarding item 9, "A nurse explained the behavioral characteristics of my baby so that I could understand them," the factor loading was below the threshold, and it overlapped with some items of information delivery support. Item 26, "A nurse used the items brought for my baby (e.g., breast milk, diapers, and mobiles) well on my behalf," overlapped with other mental care support items as it addressed consideration for mothers.

Finally, the fifth factor analysis was carried out based on the 27 items: KMO was .91, and Bartlett's test of sphericity was 3865.979 (df = 351, *p* 3]. The results indicated that the items in each factor were generally grouped with the same attributes and had relatively high total explained variance.

Ultimately, from the 33 items, six items were removed. The variance of the first factor with seven items explained 15.8%, the second factor with six items explained 14.1%, the third factor with six items explained 12.8%, the fourth factor with four items explained 12.5%, and the fifth factor with four items explained 10.2%. The total variance explained 65.3% of the 27 items (Table 2).

Factor naming

Factor 1 reflects the meaning of the nurse's direct care of infants, so it was named "baby care support." Factor 2 relates to the involvement and promotion of the maternal role, and it was named "maternal role support." Item 13 of Factor 2 is "A nurse taught me how to deal with various situations that might arise when taking care of my baby at home," and it was classified as information delivery support; however, it was thought that it could be considered as "maternal role support" when focusing on providing information to help mothers properly perform a maternal role at home, and was, therefore, moved. As Factor 3 reflects empathy for the mother and good therapeutic communication, it was named "mental care support." Factor 4 was derived from the "information delivery support" factor in a previous study [3]. It was named "introducing resources support" because it contains content regarding the introduction of necessary resources to mothers. Factor 5 was named "information delivery support" because it reflects the purpose of delivering the necessary information to mothers according to the mothers' specific situations.

Convergent and discriminant validity

The MTMM matrix showed that the correlation coefficients of the 32 items with their respective factors all exceeded .40, with a range of .48 to .80; thus, convergent validity was confirmed. The success rate of convergent validity of the items was 100%. Furthermore, the correlation coefficients of each item with other factors ranged from .20 to .68. As each item correlated to a lesser extent with other factors than their respective factors, discriminant validity was established (Table 3). The correlations of the items and their respective factors exceeded the correlations with other factors by two times the standard error of correlation coefficients, except for items 32, 12, and 10. The success rate of discriminant validity was 92.6%.

Criterion Validity

The 12 items of nursing care in the PFSQ and PNSS-MP were strongly correlated (r = .89, *p* Table 4).

Reliability

Cronbach's α of the PNSS-MP was .95. Cronbach's α of baby care support was .85, maternal role support was .88, mental care support was .88, introducing resources support was .74, and information delivery support was .86. In the split-half reliability analysis, the Cronbach's α of the first part was .89, and the latter part was .92. The Spearman-Brown coefficient was .89, and the Guttman split-half coefficient was .88, indicating good reliability [19] (Table 5).

Confirmation of the final scale

The PNSS-MP was developed to measure the nursing support perceived by mothers of preterm infants. Twenty-seven items of five factors were determined by validity and reliability tests. Items 1 to 7 concern baby care support, items 8 to 13 concern maternal role support, items 14 to 19 concern mental care support, items 20 to 23 concern introducing resources support, and items 24 to 27 concern information delivery support. The survey takes approximately 10 min to complete. The response to each item is measured using a 5-point Likert scale: "strongly disagree" = 1 point, "disagree" = 2 points, "neutral" = 3 points, "agree" = 4 points, and "strongly agree" = 5 points. A higher score indicates a higher level of nursing support perceived by mothers of preterm infants.

Discussion

This study developed a scale for measuring nursing support perceived by mothers of preterm infants. In this section, the scale development process and each component of the developed scale are discussed.

Scale development process

The study went through a concept analysis process [3] using a hybrid model to develop a realistic tool that can be applied to reflect the situation of the NICUs in South Korea. The researchers attempted to reflect NICU environments through interviews with mothers of preterm infants. Furthermore, by continually comparing the theoretical analysis and field analysis steps, we attempted to clearly elucidate the nursing support phenomenon that

can be observed in the NICUs. Through this process, a scale reflecting the actual situation in South Korea was established. In addition, the usefulness and practicality of the tool have been improved through the utilization of various literature and interview data.

For ascertaining the validity of this tool, this study carried out three content validity tests, a construct validity test using EFA, an MTMM analysis, and a criterion validity test. Until 2013, 189 studies tried to develop a scale in nursing academia, but only 28 studies (14.8%) examined the three types of validity [32]. It is important to have an expert group with rich knowledge in the field of interest and a potential user group examine the content validity of a scale through a content validity test [20]. Therefore, considering this aspect, this study carried out the content validity test twice with academics majoring in pediatric or maternal nursing, a professor of nursing with experience in tool development, and nurses with more than 10 years of experience in NICUs in South Korea. This study also examined face validity with mothers of preterm infants, who were the target sample of this study, to increase the representativeness and validity of the items.

An EFA was conducted while considering that even if the loading for one factor is high, and if a loading of .32 or more is observed in the other factor, it should be deleted [32]. An issue found in the process of EFA was that it was difficult to clearly differentiate the factors of “information delivery support.” It was confirmed that items providing information about the infant showed similar loadings to “mental care support.” The mother could attain emotional stability through information support, and in that case, information support could also be construed as emotional support [33]. “Information support” focuses on delivering facts based on knowledge, and “emotional support” helps someone to express one’s emotions. However, they are not clearly distinguishable in reality; therefore, studies have been conducted to determine the differences between them [33]. Considering this, it is necessary to further clarify the definition of subfactors of nursing support by repetitively analyzing this concept in the future. Thus, further efforts should be made to make each subfactor representative.

In scale development studies, confirmatory factor analysis (CFA) is generally used to quantify the quality of the factor structure by providing additional evidence of the construct validity, such as convergent and discriminant validity of the measurement [34]. However, this study was the first attempt to develop a nursing support scale, and the construct validity of this scale has not been established. In addition, we were limited in the number of participants we were able to recruit because of concerns of invasion of privacy and the conservative environment of a NICU, making it difficult for us to perform a CFA. Therefore, convergent and discriminant validities were explored using MTMM in this study. As such, in the future, CFA can be conducted to verify the construct validity between the 27 items and 5 factors extracted through EFA.

In this study, convergent and discriminant validities were analyzed using the MTMM matrix. This approach has long been a recognized method for determining convergent and discriminant validities [34]. Convergent validity was established, and each item had consistently correlated with the factors to which they belonged. For discriminant validity, item 32 (factor 2: maternal role support), “A nurse encouraged me by saying that I could do a good job as a mother,” item 12 (factor 4: introducing resources support), “A nurse explained each section and the regulations of the NICU to me,” and item 10 (factor 5: information delivery support), “A nurse explained my baby’s treatment process in a way I could understand,” were not well differentiated from ‘factor 3: mental care support’. It is believed that because mothers gain psychological stability and emotional benefits, such as reduced anxiety, through nursing support, mental care support is strongly correlated with other factors [13,14]. In addition, item 10 was not well differentiated from “factor 1: baby care support” as this was only possible with specialized knowledge about the baby’s treatment. This is believed to be because some parents indirectly judged nurses’ expertise in baby care through item 10. Since discriminant validity was not sufficiently secured in this study, it is necessary to re-verify the discriminant validity of the items with other subjects using other statistical methods in the future.

Twelve items related to nursing care in the PFSQ, which were used in criterion validity, were developed by the philosophy of “family-centered care.” Most of the items in the PFSQ were related to nurses’ direct care. This is why the correlation coefficient (.72) was relatively low for introducing resources support. It was believed that introducing resources support was composed of items that introduced social resources rather than the care directly provided by

nurses. One limitation of this study was that it only checked the concurrent validity to secure criterion validity. Moreover, since this study secured concurrent validity using one scale, it is necessary to secure additional criterion validity through various variables related to the concept of nursing support in the future.

Since all coefficients of the reliability test were over .80, the scale was considered to have stable reliability. However, it could be higher than actual reliability because the internal consistency test is calculated with data that are computed in one batch, and it does not consider various factors of change [35]. It is recommended to secure the stability of the tool through methods such as test-retest reliability of the self-report questionnaire to address this shortfall [24]. However, this study could not conduct a test-retest reliability assessment because recruiting the study participants was very time- and effort-consuming, and it was difficult to access the participants. It is necessary to secure the stability of the tool through repeated examinations.

Factors of PNSS-MP

Five subfactors were derived from the PNSS-MP. Therefore, each attribute will be discussed separately.

The first factor, the "baby care support" of this tool, included all items derived from the conceptual analysis results of a previous study [3]. Baby care support refers to the quality of nursing care provided to babies, and it showed an explanatory power of 15.8% in this study. Items included in baby care support were composed of sentences expressing direct care provided to babies; therefore, it is believed that they were differentiated from other items, including nursing care provided to mothers. Thus, baby care support includes the items of professional and emotional care derived from the previous conceptual analysis [3].

The second factor, "maternal role support," had an explanatory power of 14.1% in this study. Item 33, "A nurse helped me make the best decisions for baby-related matters," was deleted in maternal role support. Instead, item 13, "A nurse taught me how to handle various situations that can happen when taking care of my baby at home," previously included in information support, was included.

Item 33 was emphasized in the theoretical analysis stage in the conceptual analysis and demonstrated the core philosophy of family-centered care. However, considering the situation of NICUs in South Korea, family-centered care is not yet common, and the opinions of medical staff are weighted more than those of families [12]. Moreover, it had been consistently pointed out during the expert validity process that item 33's "decision making related to a baby" was ambiguous and unclear. Reflecting this, the factor loading of this item was .32 or more in three factors. Item 33 reflects family-centered care and emphasizes the mother's autonomy. As this item is important to maternal role support, a revision of the item should be considered in the future while considering the situation of NICUs in South Korea.

Item 13, "A nurse taught me how to handle various situations that can happen when taking care of my baby at home," was classified as "information delivery support" in the preliminary questionnaire, but it was later classified as "maternal role support." Although it was classified as "information delivery support," with an emphasis on providing information, the focus of this item was to help the mother raise her child well at home. Since "maternal role support" focuses on providing maternal role experiences and strengthening the maternal role, it would be more suitable to classify item 13 as "maternal role support."

Factor 3 concerns "mental care support," which accounted for 12.8% of the explained variance in this tool. Two items deleted from Factor 3 were item 26, "A nurse used the items brought for my baby (e.g., breast milk, diapers, and mobiles) well on my behalf," and item 27, "A nurse told me a story that encouraged me and told me that my baby was doing well." Although item 26 reflected the situation of the NICU well, it was difficult to generalize and measure objectively because the range of items that mothers were allowed to bring to a hospital differed depending on the policy of each hospital. In addition, the factor loading was .32 or more in two factors. Therefore, item 26 was thought appropriate to be deleted. Item 27, "A nurse told me a story that encouraged me while telling me that my baby was doing well," was criticized in the expert validity test, but it was mentioned as an important and necessary form of emotional support in terms of giving hope to mothers in the fieldwork phase [3]. Although the participating mothers said that the nurses' encouraging words felt like mental care support, as their babies were discharged with relatively minor health problems, this item was deleted because there would be a limit to providing such support if

the baby had serious complications or the baby's condition was poor.

Factor 4 concerns "introducing resources support," which showed 12.5% of explained variance. Items were extracted from "information related to hospitalization environment" in previous studies [3]. These items introduce the mother to resources around her to help her endure her baby's hospitalization well. This was thought to be different from providing information about the baby and was therefore separated as a different factor. Information related to the hospitalization environment mainly consisted of items that were considered important in foreign literature consulted in the theoretical analysis stage [3]. Introducing social resources to mothers of preterm infants is an important form of support in foreign countries; however, it is still rare to introduce resources to mothers of preterm infants in South Korea [3]. In foreign countries, professional psychological counselors always stay in the NICU and provide professional counseling to mothers suffering from postpartum depression after childbirth [36]. In addition, through a program called veteran parents, parents of infants with similar gestational ages and diseases who have been successfully discharged from the NICU form a peer support group and help parents obtain information [16]. Even in South Korea, parents are provided with information on various projects offered by the government through the social work office since the time of admission. It is not common in Korea to introduce social resources yet; however, as the medical environment gradually changes from "disease-centered" to "patient-family-centered," [12] it is necessary to provide information related to helpful resources to parents.

The final factor concerns "information delivery support," which has an explanatory variance of 10.5%. It consists of items that focus on how information is delivered rather than what content is delivered. "A nurse explained my baby's physical changes in a way I could understand," "A nurse explained the behavioral characteristics of my baby so that I could understand them," and "A nurse told me things about my baby's daily life that I could not observe" were deleted from "information delivery support." The deleted items were related to the content of information delivery support. As a result, the items included in "information delivery support" were mainly related to the method of delivering information. It was confirmed from this that the mother perceived information delivery methods as stronger information support than the content aspect of information. Even in previous studies, mothers wanted information to be delivered to them in an easily understandable manner at the right time, rather than receiving all information [3]. Although most of the items related to the content of information delivery support were deleted, item 19, "A nurse provided a sufficient amount of information according to my needs," was believed to broadly cover the content aspect of information delivery support. Therefore, this factor is thought to be a tool that encompasses both the content and delivery aspects of informational support.

Conclusion

We developed a tool for measuring nursing support perceived by mothers of preterm infants, which was composed of 27 items and 5 factors reflecting the medical environment of NICUs in South Korea. This scale secured relatively adequate validity and reliability; however, discriminant validity has not yet been firmly established. Future studies will need to measure the applicability and sensitivity of the developed tool in practice by continuously refining, validating, and ensuring the reliability of the tool. Based on the statistical testing, PNSS-MP is considered a promising instrument for the evaluation of nursing support in the NICU. By using the scale, it will be possible to provide professional and intensive nursing support to mothers of preterm infants. Moreover, it will help improve the quality of nursing care and ultimately realize family-centered care in South Korea.

Authors statement

Im, Mihae: Substantial contributions to the conception or design of the work; the acquisition, analysis, and interpretation of data for the work, Drafting and revising the manuscript, Approve the fianl version of the manuscript.

Oh, Jina: Analysis and interpretation of data for the work, Final approval of the version to be published, Drafting the work and revising it critically for intellectual content.

Additional comments

This article is part of the doctoral dissertation of the first author.

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Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Variables	Category	Mean ± SD or N (%)
Age (years)		33.10 ± 4.08
Education	Junior college	30 (13.5)
University	156 (70.0)	Graduate school or above
37 (16.5)	Monthly income (million won)	<200
17 (7.6)	200 ≤ and <300	57 (25.5)
300 ≤ and <400	63 (28.3)	400 ≤ and <500
34 (15.3)	≥500	52 (23.3)
Religion	None	106 (47.5)
Christian	65 (29.2)	Catholic
25 (11.2)	Buddhist	25 (11.2)
Others	2 (0.9)	Birth order of preterm baby
First	134 (60.1)	Second
61 (27.4)	Third	26 (11.6)
Fourth	2 (0.9)	Birth gestational age (weeks)
	31.14 ± 3.23	Birth weight (gm)
	1,643.81 ± 623.55	Duration of hospitalization in NICU (months)
	1.72 ± 0.96	Age of baby at the time of survey (months)

No	Items	Communality	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
	A nurse…		Baby care support	Maternal role support	Mental care support	Introducing resources support	Information delivery support
3	Came and looked after my baby when my baby was crying	.60	.72	.13	.17	.14	.08
6	Expressed love and concern while looking after my baby	.62	.72	.09	.26	.11	.12
2	Took good care of my baby considering my baby's characteristics	.60	.62	.25	.24	.13	.28
7	Provided emotional stimulation (e.g., talking, hugging, and eye contact) to my baby	.59	.62	.24	.17	.34	.00
5	Helped my baby stay clean	.46	.62	.13	.00	.11	.22
4	Responded appropriately when my baby's monitor alarm sounded	.46	.61	.10	.20	.06	.20
1	Provided care for my baby based on their professional knowledge	.57	.58	.22	.19	-.17	.35
29	Allowed me to play my role as a mother by directly participating in baby care (e.g., feeding, medication and bathing)	.78	.19	.82	.02	.01	.27
30	Assessed my baby's care techniques (e.g., feeding, medication and bathing)	.74	.13	.80	.09	.19	.18
31	Gave me confidence that I could take good care of baby with feedback	.76	.22	.70	.33	.32	.09

28	Allowed me to feel maternal love through contact with my baby (e.g., holding hands and feet, hugging, and kangaroo care)	.58	.14	.70	.22	.09	.13
32	Encouraged me by saying that I could do a good job as a mother	.70	.25	.57	.41	.38	-.01
13	Taught me how to handle various situations that can happen when taking of my baby at home	.62	.38	.52	.06	.36	.26
24	Spoke to me in a friendly tone	.76	.19	.12	.78	-.09	.30
23	Welcomed me with a warm smile at each visit	.72	.27	.09	.76	.05	.26
25	Created a comfortable atmosphere for me to ask questions about my baby	.68	.14	.24	.64	.14	.40
22	Empathized with my feelings of being separated from my baby	.79	.29	.33	.57	.51	-.01
21	Comforted me as I was having a hard time giving birth to a preterm infant	.75	.30	.31	.55	.51	-.03
20	Listened carefully to my worries and concerns	.70	.38	.26	.49	.39	.30
16	Introduced me to a specialist who could help me with psychotherapy and counseling	.76	-.05	.07	.01	.86	.15
15	Informed me about peer groups of mothers of preterm infants (e.g., online communities and local meetings)	.68	.10	.19	.07	.78	.13
14	Provided resources that could help me economically (e.g., national financial support project)	.50	.28	.21	.09	.56	.24
12	Explained each section and the regulations of the NICU to me	.48	.30	.09	.09	.45	.41

18	Explained to me in an easy-to-understand manner and based on my level of knowledge	.77	.25	.26	.35	.18	.69
17	Tried to give an answer in other ways, if it was not possible to answer my question immediately	.63	.23	.19	.21	.22	.67
19	Provided a sufficient amount of information according to my needs	.73	.34	.27	.30	.30	.61
10	Explained my baby's treatment process in a way I could understand	.61	.40	.20	.33	.14	.53
	Eigen value		4.26	3.80	3.45	3.38	2.75
	Explained variance (%)		15.77	14.05	12.77	12.52	10.17
	Cumulative explained variance (%)		15.77	29.82	42.59	55.11	65.28

Factors	No. of item	Factors					
Factor 1: Baby care support	Factor 2: Maternal role support	Factor 3: Mental care support	Factor 4: Introducing resources support	Factor 5: Information delivery support	r-2SE	Factor 1	3
.64	.42	.47	.41	.46	.60	6	.67
.39	.53	.34	.51	.63	2	.67	.51
.57	.44	.60	.63	7	.60	.51	.52
.46	.47	.56	5	.54	.35	.36	.34
.43	.49	4	.55	.38	.46	.36	.44

.50		1	.56	.39	.43	.20	.54
.51	Factor 2	29	.43	.68	.42	.30	.47
.64	30	.41	.74	.46	.41	.46	.71
31	.50	.80	.63	.49	.56	.78	28
.40	.62	.49	.33	.42	.58	32	.49
.69	.65	.49	.52	.65		13	.58
.60	.50	.57	.55	.56	Factor 3	24	.46
.39	.64	.24	.52	.60	23	.52	.41
.68	.32	.56	.64	25	.48	.51	.67
.41	.63	.63	22	.54	.62	.75	.57
.56	.72	21	.53	.59	.73	.56	.53
.70		20	.63	.62	.74	.58	.68
.71	Factor 4	16	.18	.31	.33	.54	.32
.49	15	.32	.44	.44	.60	.35	.56
14	.44	.47	.49	.59	.46	.55	

12	.52	.40	.44	.48	.51	.43	Factor 5
18	.57	.64	.64	.48	.80	.78	17
.50	.54	.54	.43	.63	.59	19	.62
.66	.66	.54	.77	.74	10	.61	.51

	Baby care support (Factor 1)	Maternal role support (Factor 2)	Mental care support (Factor 3)	Introducing resources support (Factor 4)	Information delivery support (Factor 5)	PNSS-MP
Nursing care in PFSQ	.83	.85	.88	.72	.85	.89
p-value	<.001	<.001	<.001	<.001	<.001	<.001

Category		Items	Cronbach's α
Total	PNSS-MP	27	.95
Factor 1	Baby care support	7	.85
Factor 2	Maternal role support	6	.88
Factor 3	Mental care support	6	.88
Factor 4	Introducing resources support	4	.74
Factor 5	Information delivery support	4	.86

Division	Cronbach's alpha	Correlation between a &b (p-value)	Spearman-Brown	Guttman
a. Pre	.89	.81 ($p < .001$)	.89	.88

DETAILS

Subject:	Parents &parenting; Validity; Premature birth; Premature babies; Families &family life; Likert scale; Newborn babies; Intensive care; Mothers; Nurses; Pediatric nursing; Hospitalization; Anxiety
Location:	South Korea
Identifier / keyword:	infant; intensive care units; mothers; neonatal; premature birth
Publication title:	Asian Nursing Research; Seoul
Volume:	15
Issue:	5
Pages:	317-326
Publication year:	202 1
Publication date:	Dec 2021
Section:	Research Article
Publisher:	Elsevier Limited
Place of publication:	Seoul
Country of publication:	United Kingdom, Seoul
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Effects of Lavender on Anxiety, Depression, and Physiological Parameters: Systematic Review and Meta-Analysis

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ABSTRACT (ENGLISH)

SummaryPurpose

The recent evidence suggested substantial anxiolytic efficacy of lavender. The aim of this study was to examine the efficacy of lavender for anxiety, depression, and physiological parameters and to elucidate the differential effects of lavender on anxiety and depression by study characteristics.

Methods

A systematic review and meta-analysis was performed following the PRISMA guidelines. We searched PubMed, Embase, Cochrane Library, Web of Science, and Cumulative Index of Nursing and Allied Health Literature databases for randomized controlled trials investigating the efficacy of lavender on anxiety, depression, or physiological parameters in humans. We assessed the risk of bias within studies with the revised Cochrane risk of bias tool for randomized trials. We used random effect model to estimate the average effect and computed bias-corrected standardized mean difference as effect size metric, Hedges’ ĝ for all outcomes.

Results

Lavender was superior to placebo or no treatment in reducing anxiety (Hedges' ĝ = −0.72, 95% confidence interval [CI] −0.90 to −0.55, *p* value <.001), depression (Hedges' ĝ = −0.43, 95% CI, −0.59 to −0.27, *p* value <.001), and systolic blood pressure (Hedges' ĝ = −0.23, 95% CI, −0.41to −0.05, *p* value = .01). The moderator analysis by meta-regression indicated that route of administration accounted 6.5% (*p* value = .187) for the heterogeneity in anxiolytic effects, sessions of treatment accounted 13.2% (*p* value = .055), and participants’ health state accounted 8.9% (*p* value = .131) for the variance in anxiolytic effects.

Conclusion

Lavender aromatherapy showed substantial effect in reducing anxiety and depression, and sessions of administration increased the anxiolytic effects. The effects on physiological parameters showed small with inconsistent significances and randomized controlled trials on the effect of lavender on depression were scarce.

Future trials on depression and physiological parameters are recommended, and increasing the sessions of administration is recommended.

FULL TEXT

Introduction

Anxiety disorders are the most prevalent mental disorders around the world and are associated with significant comorbidity and morbidity [1]. Anxiety is a characteristic feature of modern times, and the prevalence of anxiety disorders has increased in response to political, societal, economical, and environmental changes [2]. The result of meta-regression adjusted for methodological difference indicated the global prevalence of anxiety disorders as 7.3% [3].

The etiology of anxiety disorders includes an interaction of psychosocial factors, for example, childhood adversity, stress, or trauma, and a genetic vulnerability, which manifests in neurobiological and neuropsychological dysfunctions [4]. Anxiety disorders are often comorbid with other anxiety disorders, major depression, or substance abuse [5]. Current anxiolytic treatment options have limited efficacy, such as delayed onset (e.g., selective serotonin reuptake inhibitors, serotonin–norepinephrine reuptake inhibitors, and buspirone) as well as the potential for habituation, tolerance, and abuse (e.g., benzodiazepines and pregabalin) [6]. In addition, anxiolytic agents may cause side effects, such as sedation, impaired concentration, amnesia, depression, delirium, dependency, and, not least, withdrawal syndrome [7]. Therefore, there is a demand for efficacious, safe, and acceptable anxiolytics that are also applicable in subthreshold conditions [8].

Lavender oil administered by different routes has been recognized for centuries for promoting “well-being” and for reduction of distress [9]. Lavender, a plant from the Lamiaceae family, comes in many species with different chemical characteristics. The lavandula genus has approximately 30 species grown around the world that share similar major chemical constituents and properties [10]. Lavender oil is the essential oil extracted from flowers and stalks of the lavender plant by steam distillation. It is a colorless or pale-yellow liquid with a sweet, floral, herbaceous aroma [11]. Lavender oil is a multi-ingredient mixture that contains more than 160 substances. The major components of lavender oil are linalool, linalyl acetate, 1,8-cineole, b-ocimene, terpinen-4-ol, and camphor [12].

Silexan, a proprietary essential oil from *Lavandula angustifolia* flowers, has been approved in Germany and several other countries for the oral treatment of anxiety [9]. Silexan® showed pronounced anxiolytic effects in patients with subthreshold anxiety disorders [13, 14] at a daily oral dose of 80 mg (1 capsule) as well as in anxiety-related restlessness and agitation [15] and generalized anxiety disorder for daily single doses of 80 mg and 160 mg [16–18]. Moreover, evidence for antidepressant-like properties of Silexan has been observed in anxious patients suffering from comorbid depressive symptoms and in patients with mixed anxiety–depression disorder [19], which may indicate intrinsic antidepressant-like properties independent of its anxiolytic activity [20].

The neuroendocrine response to the stressors involves the activation of the hypothalamic–pituitary–adrenocortical axis, resulting in the release of the glucocorticoid hormone cortisol from the adrenal cortex into blood, and the autonomic response is the activation of the sympathetic-adrenergic system, culminating in the release of adrenaline and noradrenaline from adrenal medulla into the blood circulation [21]. Cortisol is produced in the adrenal cortex and is the main glucocorticoid hormone in humans. It is released in response to various psychosocial stimuli, such as anxiety and stress via hypothalamus–pituitary–adrenal axis. Endocrinological stress markers such as cortisol are useful for objectively evaluating psychosocial distress, including stress or anxiety. In addition to self-reporting anxiety measure, physiological parameters including blood pressures, heart rate, or salivary cortisol level are useful for evaluating anxiety objectively.

The existing evidence has suggested anxiolytic and antidepressant properties of lavender based on clinical trials. However, the evidence based on systematic review and meta-analysis has concentrated on anxiolytic effects exclusively [22–24]. And the reviews have presented the overall anxiolytic effects with substantial heterogeneity, but the potent source of variations in effects, such as study design, sample characteristics, or intervention characteristics, has not yet been identified adequately.

The first aim of the present review is to identify the overall effects of lavender for anxiety and its physiological referents and depression. The second aim is to investigate moderating factors for substantial variations in effect on anxiety and depression. Specifically, we assumed that the effects of lavender might vary with the study characteristics comprising the routes of administration, sessions of intervention, and health conditions of populations. The results of this review could provide a scientific evidence for applying lavender for the amelioration of anxiety and depression levels.

Methods Study design

A systematic review and meta-analysis was performed to examine the effects of lavender on anxiety, depression, and physiological parameters following the PRISMA guidelines.

Eligibility criteria

Study characteristics used as criteria for eligibility are as follows: (1) population: clinical trials with human subjects of any age, sex, and with or without diseases were included; (2) intervention: lavender administration with any route of administration, any type of preparation, and any species of lavender; (3) comparator: no intervention, standard or routine care, or placebo; (4) outcomes: primary outcomes were anxiety and depression measured by validated or standardized measures; secondary outcomes were physiological parameters of anxiety, that is, blood pressures, heart rate, or salivary cortisol; and (5) study design: randomized controlled trials (RCTs). We excluded RCT studies that compared different types of lavender preparations without a control group or used combined lavender treatments. Trials with missing essential data were excluded from qualitative and quantitative synthesis. Trials with animal subjects were excluded.

Report characteristics used as eligibility criteria are all studies written in English and published from 2010 to 2019. Since recent systematic reviews and meta-analyses on assessing the effect of lavender in the treatment of anxiety screened up to November 2018 [[22–24]], we limited publication year from 2010 to 2019 for up-to-date evidence and avoiding duplication of results. Trials regardless of publication status were all included except for those published in abstract form only.

Information sources

The title/abstract/keywords fields of Cochrane Library, MEDLINE and PubMed Central via PubMed, Embase, Cumulative Index of Nursing and Allied Health Literature, and Web of Science databases were systematically searched for eligible articles. We checked out references of articles retrieved from database searches to locate additional relevant articles.

Search

We searched databases and references from located articles from May 15, 2019, to June 15, 2019. We used Boolean operators to search for the following terms: (*lavender OR lavandula OR silexan)* AND (*anxiety OR anxious OR anxiolytic OR stress* OR *depression OR depressive*) and derivatives of those terms, including MeSH thesaurus terms. We set additional filters to publication years: “from 2010 to 2019,” article type: “randomized controlled trial,” language: “English,” and species: “humans” in the database searches. The full electronic search strategy for MEDLINE and PubMed Central was presented in supplementary material ([Appendix E]).

Study selection and data collection process

Two reviewers (E.N. and Y.L.) performed eligibility assessment individually. In case of disagreement, the items were discussed and resolved by consensus between the two reviewers. We then established a coding structure for data extraction and pilot-coded it on five randomly selected included trials and revised it accordingly. Two of the authors (M.K. and H.K.) independently coded the data, and the other two authors (E.N. and Y.L.) checked the coded data. Disagreements were resolved through discussion among all reviewers.

Data items

The authors extracted the following descriptive and numerical data from the included studies: (1) settings and characteristics of participants; (2) intervention (such as a method of application, dose, frequency, and duration of lavender aromatherapy); (3) measured outcomes of anxiety, depression, and physiological parameters of anxiety; (4) comparator interventions; (5) adverse effects of the intervention; (6) numerical data for meta-analysis: mean,

standard deviation, randomized, and analyzed sample sizes of treatment groups, sessions and doses of interventions, and length of follow-up.

Risk of bias in individual studies

Bias assessment was performed by two independent assessors (M.K. and H.K.) based on the primary outcome (self-rated anxiety and depression) level using the revised Cochrane risk-of-bias tool for randomized trials (RoB 2) [25]. Disagreements were resolved by discussion between reviewers (E.N. and Y.L.) until consensus was made. As we planned to estimate the effect of starting and adhering to lavender intervention, we assessed the risk of bias based on per-protocol analysis.

The RoB 2.0 for individually randomized trials has five domains, including bias (1) from the randomization process, (2) due to deviations from intended interventions, (3) from missing outcome data, (4) in measurement of the outcome, and (5) in selection of the reported result. Each risk of bias domain has three response options, comprising low, some concerns, and high risk of bias. One of the key innovations of the RoB 2.0 is automatic judgement of overall risk of bias via algorithm by the risk of bias judgments of the individual domains in each study.

Summary measures and synthesis of results

In the meta-analysis of all outcomes, including anxiety, depression, and physiological parameters, the bias-corrected standardized mean difference (Hedges' ĝ) was calculated as the effect size metric. Standardized mean differences are upwardly biased when samples are small, especially less than 20 participants, and Hedges suggested a correction for small sample bias, known as Hedges' ĝ [26].

We assessed the heterogeneity in effects using I^2 statistics and Cochran's Q based on Chi-squared statistics. If an I^2 value was greater than 50% and the *p* value of Chi-squared was below 0.1, we concluded that there was substantial heterogeneity.

We used the inverse variance weighting for pooling the results of individual studies. Based on the assumption that the true effect might vary across samples and populations, depending on the health conditions of populations, type or sessions of interventions, and study design artifacts, we estimated the mean effects using the random effect model.

Meta-analyses were calculated in R software version 4.0.2 [27] using packages meta and metafor. We also performed meta-analyses in Review Manager 5.4 (Version: 5.4.1) [28] using non-Cochrane mode.

Risk of bias across studies

Publication bias across studies was assessed with funnel plot followed by linear regression of intervention effect estimate against its standard error (Egger's regression) as tests for funnel plot asymmetry. Publication bias was assessed only when at least 10 studies were included in the meta-analysis because when there are fewer studies, the power of the tests is too low to distinguish chance from real asymmetry [29]. We assessed publication bias in each meta-analysis on the primary outcomes anxiety and depression.

Additional analyses

When substantial heterogeneity in effects in any meta-analysis was identified, moderator analysis by meta-analysis of variance (ANOVA) and/or meta-regression was performed to examine factors creating variations in effect sizes across studies.

In each meta-analysis, subgroup analysis and/or moderator analysis was performed to see whether lavender intervention might have differential effects for different subgroups by study characteristics. Moderator analysis can be performed by two main statistical methods including meta-ANOVA and meta-regression; both approaches require at least 10 studies for every moderator in the analysis. In the meta-analysis on anxiety, we performed three moderator analyses by the route of administration, health state of participants, and sessions of treatment. Meta-regression was used to identify the amount of heterogeneity accounted for by each moderator.

In the meta-analysis on depression, as the number of included studies was 10, we performed a moderator analysis by the route of administration of lavender.

To identify the effect of the risk of bias assessments for the variation of mean effect, we performed a sensitivity analysis to examine whether inclusion of the studies at high overall bias influences the mean effect. And we

performed a subgroup analysis by assessment of risk to examine the difference between studies at high, some concerns, and low risk.

Results Study selection

A total of 562 citations were retrieved through database searches, and additional 12 trials were identified by reviewing the references of the selected articles. After duplicates were excluded, 378 studies remained. Then we evaluated the titles and abstracts and excluded 298 articles. The remaining 80 full-text articles were screened for eligibility, and 42 articles were excluded. Finally, 38 articles were included in qualitative analysis, and 37 articles were included in quantitative synthesis. Details of the process of screening and selection of the studies were presented in Figure 1. The final included articles are listed in the supplementary material (Appendix A).

Study characteristics

Characteristics of all included studies were summarized in the supplementary materials (Appendix B). Methods and overview of the studies are as follows: 38 RCTs published in English from 2010 to 2019 were included in qualitative synthesis, and 37 of 38 studies were included in quantitative synthesis. Geographic origins of the studies are Iran (17 trials), Turkey (8), Germany (4), Greece (1), India (1), South Korea (2), Taiwan (3), the United States (1), and Thailand (1).

Across all studies included in quantitative analyses, a total of 4316 participants were randomized to either lavender (2165) or control treatment (2151). In the meta-analysis on anxiety, a total of 3906 participants (lavender 1955 and control 1951) were randomized, and 3825 (lavender 1917 and control 1908) were analyzed. In depression, a total of 1312 participants (lavender 657 and control 655) were randomized, and 1282 (lavender 644 and control 638) participants were analyzed. Studies included in meta-analysis on cortisol a total of 206 participants were randomized to either lavender (102) or control treatment (104), and 180 (lavender 96, control 94) were analyzed. Pooled premature withdrawal rates were 1.94% for lavender and 2.2% for control group in analysis for anxiety, 1.98% for lavender and 2.60% for control group in analysis for depression, and 5.9% for lavender and 9.6% for control in analysis for salivary or serum cortisol.

The populations of the studies included in the analysis for anxiety consisted of patients undergoing surgery or invasive procedure, critically ill patients with cardiac diseases or in intensive care units, healthy students under stressful conditions, pregnant or postpartum women, and patients in anxiety and/or depressive disorders. The participants of studies on depression were composed of patients undergoing hemodialysis, women in pregnancy, postpartum, or menopause, patients in anxiety and/or depression or dementia, or healthy students with premenstrual syndrome.

The participants in the experimental group received one of four routes of administration of lavender: inhalation, massage, tea, or oral preparation (silexan). The participants in the control group received standard or routine care, placebo, or no treatment. The details of dose, duration, and sessions of experimental and control treatments are presented in supplementary material (Appendix B).

The primary outcomes measured were anxiety and depression, and the secondary outcomes measured were physiological indicators of anxiety. Of all 38 included studies, self-rated anxiety was assessed in 30 studies, and depression was evaluated in 10 studies. Anxiety was measured by standardized measure (visual analog scale) or validated measures (Beck Anxiety Inventory, Depression Anxiety Stress Scale, Hospital Anxiety and Depression Scale, Hamilton Anxiety Scale, Modified Dental Anxiety Scale, State-Trait Anxiety Inventory, or Zung Self-Rating Scale). Depression was measured by validated measures including Beck Depression Inventory, Cornell Scale for Depression in Dementia–Chinese version, Edinburgh Postnatal Depression Scale, Premenstrual syndrome (depressive affect subscale), Hospital Anxiety and Depression Scale, Hamilton Rating Scale for Depression, and Montgomery Åsberg Depression Rating Scale.

Blood pressures were assessed in seven studies and heart rate was assessed in six studies, salivary cortisol was assessed in two studies, and serum cortisol was assessed in one study.

Risk of bias within studies

Figure 2A shows the risk of bias summary presenting the assessment in each domain and overall risk of bias. The

overall risk of bias was evaluated as low in 16 trials, as some concern in 16 trials and as high risk of bias in five trials.

The risk of bias from the randomization process was rated as high in only one study, some concern in 10 studies, and low in the remaining 26 studies. Bias in measurement of the outcome was assessed as high in four trials, some concern in 15, and low in 18 trials. Bias due to deviations from intended interventions was rated as some concern risk in only two trials and low risk in the remaining 35 trials. Figure 2B presents the risk of bias graph of included studies according to the revised Cochrane risk-of-bias tool for randomized trials (ROB 2).

Results of individual studies and synthesis of results

We first conducted basic meta-analyses for each outcome: anxiety levels, physiological parameters (systolic blood pressure, diastolic blood pressure, heart rate, and cortisol levels), and depression levels.

As treatment effects are inconsistent across study characteristics of populations, sessions, durations, and types of intervention, comparison conditions, and methodological features, we hypothesized that the route of administration, sessions of treatment, and health state of population might moderate variations in effect sizes across studies. Subgroup and moderator analysis may be used to explore possible sources of variability in combined effects. According to *Cochrane Handbook for Systematic Reviews of Interventions* version 6.1 [29], subgroup and moderator analysis require at least 10 studies for each moderator. The reason is the statistical power of moderator analysis is affected by the number of included studies and moderators. As our meta-analysis on anxiety included 30 studies, we conducted three subgroup and moderator analyses by route of administration, health state of population, and sessions of treatment using meta-analysis of variance or meta-regression whether the moderator variable is continuous or categorical. Also, the analysis on depression included 10 studies; only one moderator analysis by the route of administration was conducted.

Finally, we performed a sensitivity analysis to determine the effect of study quality on the mean effect. Specifically to examine the inclusion of studies at high risk of bias affects the overall effect on anxiety levels, sensitivity analysis deleting each study was done.

The meta-analysis for self-rated anxiety included 30 studies to evaluate the overall effects of lavender intervention (Figure 3A). Lavender was significantly superior to comparators (standard care, placebo, or no treatment). The mean effect (Hedges' ĝ) was −0.72 (95% confidence interval [CI] −0.90 to −0.55), and the direction of the mean effect favored lavender. The analysis also showed that lavender intervention was significantly superior to comparator in 21 of 30 trials, with the largest effect of −2.56 (95% CI −3.25 to −1.86). The heterogeneity statistics were I^2 = 84%, p > .001, indicating substantial heterogeneity.

The results for the physiological parameters are presented in Figure 3B. The efficacy on the self-rated anxiety was not supported by the physiological parameters except for systolic blood pressure (SBP). Each meta-analysis for SBP and diastolic blood pressure (DBP) included seven studies, and six studies for heart rate, and three studies were included in the analysis for cortisol. The effect size on the SBP was −0.23 (95% CI −0.41 to −0.05). The effect of lavender on DBP was −0.15, the effect on heart rate was −0.2, and the effect on salivary/serum cortisol was −1.4. However, the effects of DBP, heart rate, and cortisol showed no significance.

The meta-analysis on the antidepressive effect included 10 studies. The meta-analysis showed that lavender was superior to placebo or no treatment comparators with the mean effect of −0.43 (95% CI −0.59 to −0.27; Figure 3C). The meta-analysis showed that lavender was superior to control treatment significantly in 7 of 10 RCTs, with the treatment effects ranging −0.18 to −1.2. The statistics of heterogeneity showed a significant medium size heterogeneity (I^2 = 47%, p = .05).

Risk of bias across studies

To evaluate potential publication bias, funnel plots were drawn, and then Egger's regression test was performed for self-rated anxiety and depression (see Funnel plots in Supplementary material, Appendices C and D). The funnel plot for standard error and effect sizes on anxiety seemed somewhat asymmetrical, seemingly empty in the lower-right area. However, Egger's regression showed no evidence of significant publication bias (t = −1.04, df = 28, p = .308). Egger's regression on depression also showed no evidence of publication bias (t = −1.61, df = 8, p = .146).

Because the publication biases for both anxiety and depression showed no significant evidence of biases, the results of our meta-analyses on anxiety and depression could be regarded as representative of the population of all published studies.

Additional analysis

Although the overall effect of the lavender treatment on self-rated anxiety levels showed significant medium to large size (ĝ = −0.72, 95% CI: −0.90 to −0.55), the effect sizes of individual studies around the mean effect showed substantial variability. The heterogeneity statistics showed I^2 = 84%, Chi-squared = 104.75, df = 29, and $p > 0.001$. Intervention effects are often heterogenous across study characteristics, including populations, interventions, comparisons, measures of outcomes, and methodological features. These study factors can moderate the effects of interventions and be sources of heterogeneity in combined effects.

Subgroup and moderator analyses can be done for the purpose of investigating heterogeneous results or to explore specific questions about particular patient populations, methods of intervention, or quality of study [29]. In subgroup analysis, the test of significance indicates whether effects were significant within subgroups not whether differences in effects were significant between subgroups. Moderator analysis provides tests of the differences in effects between subgroups and influences of moderators on the overall effect. The two statistical methods for moderator analysis are meta-analysis of variance (ANOVA) and meta-regression, both approaches require at least 10 studies for each moderator to ensure statistical power of the analysis.

We hypothesized in the protocol that the effects of lavender could vary with study characteristics, including routes and sessions of administration of lavender, health conditions of populations, and methodological quality, but the number of included studies in the meta-analysis for anxiety levels was 30; we conducted three moderator analyses, including (1) the routes and (2) sessions of administration and (3) health conditions of populations. The results of subgroup/moderator analysis for the anxiolytic effect are presented in Table 1.

The subgroup analysis by the route of administration showed that the application of lavender using massage, inhalation, and oral administration (silexan) was significantly superior to standard care, placebo, or no treatment comparators. The mean effect of lavender inhalation was −0.83, and the effect of lavender using massage was −0.60, and silexan showed the smallest effect of −0.41.

The moderator analysis using meta-ANOVA to test statistical significance for different mean effects between routes of lavender indicated no statistical significance ($Q_b(df) = 3.35(2)$, $p_b = .187$). To examine the possible impact of the route of administration for the heterogeneity of the overall effect of lavender on anxiety, we conducted additional moderator analysis using meta-regression. Meta-regression can be used to assess the potential impact of one or more continuous or categorical moderators. Categorical variable of the route of administration was expressed as a set of dummy variables with one omitted category in the meta-regression. Therefore, our meta-regression showed that routes of administration accounted for 6.5% for the heterogeneity of the mean effect; the result showed no significance just the same as the statistical result of meta-ANOVA.

As the statistical power of moderator analysis is affected by the number of studies and the number of moderators, we should be cautious to interpret the results. The moderator analyses displayed meaningful results that meta-ANOVA showed that treatment effects according to the routes of administration were clearly different, and the meta-regression indicated the route of administration accounted 6.5% for the variance of mean effect. But both moderator analyses showed no statistical significance; we can consider the possibility of the lack of statistical power by insufficient number of studies in the analyses.

The subgroup analysis for the effect of lavender on anxiety by health conditions of populations showed that the mean effect was −0.79 (95%CI: −1.05 to −0.53) for populations undergoing surgery or invasive treatment, −1.00 (−1.35, −0.64) for the populations with coronary diseases or patients in intensive care unit (ICU) group, −0.53 (−0.90, −0.15) for healthy population and −0.41 (−0.83, 0.02) for populations in anxiety and/or depression conditions. Lavender aromatherapy showed the largest efficacy in population with coronary diseases and/or patients in ICU and the efficacy for population with anxiety and/or depression showed the smallest and no statistical significance.

We performed both meta-ANOVA and meta-regression to explore possible influence of health conditions of

populations on the variation of the mean effect. The meta-ANOVA indicated that different mean effects between health conditions of population were not statistically significant (Qb(df) = 5.63(3), p_b = .131). The mean effects of subgroups of health condition of population were considerably different and the meta-regression showed that health conditions of population accounted 8.9% for the heterogeneity in mean effect (QM(df = 3) = 5.63, p = .131), but both moderator analyses showed no statistical significance. This might be ascribable to possible lack of power because of insufficient number of studies.

The meta-regression to test moderating effect of sessions of treatment showed that sessions of intervention accounted 13.18% for variations of mean effects significantly (QM = 3.68, df = 1, p = .05). Regression coefficient of sessions was b = 0.0057, and the regression equation can be suggested as Y = 0.0057*sessions –0.82. This result means that the more sessions of treatment make the larger effect sizes on anxiety.

Consequently, we could explain the moderators such as previously mentioned route of administration of lavender and health states of population and sessions of administration can reasonably influence the variability of the mean effect; only the test of statistical significance failed because of possible insufficient statistical power. Random effect model easily concludes nonsignificance.

We performed a subgroup and moderator analysis to test the different means of antidepressive effects by routes of administration (Table 2). The subgroup analysis showed the mean effect of inhalation on depression was −0.43 (95% CI −0.77 to −0.08), the mean effect of massage was −0.63 (95% CI −1.08 to −0.17), the mean effect of silexan was −0.42 (95% CI −0.72 to −0.12). Lavender tea showed no significant effect, and effect size was the smallest (−0.32).

The moderator analysis by meta-ANOVA indicated that the different mean effects between inhalation, massage, tea, and silexan was not significant (Q = 0.95, df = 3, p_b = .814). And also, the meta-regression indicated that the route of administration did not account for heterogeneity in mean effect (0%).

Finally, we performed a sensitivity analysis to examine whether the risk of within-study bias influence the mean effect of lavender on anxiety (Figure 4). Specifically, to examine the inclusion of studies at high overall risk impact the mean effect, we estimated the mean effect after deleting each study at high overall risk.

According to sensitivity analysis, the mean effect changed to −0.68 from −0.66 after deleting the study of Bekhradi [30], −0.66 after deleting Hosseini [31], −0.65 after deleting Senturk [32], −0.68 after deleting Yayla [33], and −0.62 after deleting Zabirunnisa [34]. Consequently, deleting each study at high overall risk did not change the mean effect significantly. So the mean anxiolytic effect of lavender demonstrated relatively robust and does not seem to be sensitive to the inclusion of the studies at high risk.

Discussion Summary of evidence

The use of lavender essential oil has become popular in aromatherapy, and its therapeutic efficacy has been assessed in a large number of clinical trials. Aromatherapy with lavender essential oil was found to be effective in decreasing anxiety and its comorbid depression in various settings. Physiological parameters did not demonstrate consistent effects among parameters. Lavender showed significant decrease in systolic blood pressure but did not affect DBP, heart rate, and salivary or serum cortisol significantly.

Our meta-analysis demonstrated that lavender is superior to controls, including standard care, placebo, or no treatment in decreasing self-rated anxiety in diverse populations. The overall risk of bias in the primary studies assessed with revised ROB tool displayed that 5 of 37 studies were rated as high risk. But judging from the sensitivity analysis, deleting each high-risk study did not change the mean effect distinctly, implying the effect sizes of high-risk studies might not be overestimated. Consequently, the overall effects demonstrated relatively robust and do not seem to be influenced by the study quality of the included studies.

Our meta-analysis confirmed the results of Kang et al [22] and Donelli et al [24] in the efficacy for a significant decrease in anxiety, although the magnitude of the effect varied slightly. The mean effect on anxiety levels of −0.72 can be interpreted as medium to large [35]. This effect is larger than the evidence (−0.65) of the review of Kang et al [22], which synthesized 19 studies published 2000 to 2019. As the present review included 30 studies published from 2010 to 2019, the change of effect sizes between the reviews is noteworthy.

As our meta-analysis included studies administering routes of inhalation, massage, and oral silexan and also included studies comprising participants in diverse health states, the analysis demonstrated substantial heterogeneity in effects.

According to subgroup analysis by the route of administration, the effect size of inhalation was the largest other than massage and silexan. Our meta-analysis confirmed the results of Kang et al [22] and Donelli et al [24] in the efficacy of inhalation for a significant decrease in anxiety, although the magnitude of the effect varied slightly. The effect estimate of inhalation (−0.83) is slightly larger than other evidence −0.71 [22] and −0.73 [24]). The result of our review and previous reviews suggest that inhalation of lavender oil is effective in decreasing anxiety levels in high anxiety inducing situations considerably. The inhalation of lavender essential oil can be recommended as efficacious intervention to decreasing anxiety in people in diverse situations of anxiety.

The massage with lavender oil showed medium to large anxiolytic effect (−0.60). This effect estimate is similar to other evidence (−0.61 [22], −0.66 [24]). Therefore, combined with the previous evidence, the massage with lavender oil can be interpreted to have substantial effect of relieving anxiety for populations in anxiety conditions.

The oral lavender silexan also confirmed a significant anxiolytic effect. The included studies in meta-analysis for silexan showed high study quality of all low risk in overall risk of bias. The result confirms the evidence of Kang et al [22], Donelli et al [24], and Möller et al [23], although the magnitude of the effect is different slightly and the effect measures are different (Hedges' ĝ vs. weighted mean difference).

The analysis for publication bias by funnel plot and Egger's regression showed no evidence of publication bias, which signifies our sample of meta-analysis may be representative of the population of published studies on this topic. Consequently, the evidence of the anxiolytic effect of lavender can be interpreted as fairly robust considering the quality of research designs, no evidence of publication bias, and CIs that do not cross the line of no effects.

Vital signs and salivary cortisol are recognized as important physiological measures that indirectly indicate anxiety. Our results indicated that lavender has a decreasing effect on SBP. The effect size is small, but it can be interpreted as meaningful change because systolic blood pressure may be difficult to change. The risk of bias of included studies on physiological measures was low, as the effects of these outcomes would not be affected by participants' awareness of intervention. Therefore, study quality might not influence treatment effects. In conclusion, the effect of lavender on blood pressure is small but not weak based on consistent effect sizes, significant effect, and strong study quality.

The efficacy of lavender on diastolic pressure and heart rate showed small effect sizes of −0.15 and −0.20 and no significant effects. The effect of cortisol was −1.4 with no statistical significance. We can interpret that there is no evidence that the mean effect is statistically different from no effect. However, no evidence of an effect is not the same as evidence of no effect, that is to say, no significant effects do not prove that there is no effect. An alternative explanation may be because of too small sample size or too much heterogeneity. The results of DBP, heart rate, and cortisol can be attributed to insufficient statistical power due to overly few studies because statistical power is affected by the number of studies in the meta-analysis. Therefore, we recommend future studies of RCTs investigating the anxiolytic efficacy of lavender on physiological or endocrinological stress markers such as vital signs or cortisol.

Depression has been recognized as a major comorbidity symptom of anxiety. Our results demonstrate that lavender has a favorable relieving effect on depression levels. The mean effect was medium effect size according to Cohen's standard [35]. Subgroup analysis indicated that route of lavender application tea, massage, and silexan showed significant antidepressive effects, and massage with lavender demonstrated the largest effect size. Only inhalation showed no significant effect. The evaluation of the risk of bias across studies indicated that there is no evidence of publication bias. This evidence on antidepressive effect of lavender is not able to be compared with other evidence because published evidence on this topic could not be located.

In conclusion, lavender aromatherapy by means of massage, silexan, or tea significantly decreases depression in people with various health conditions. There is some evidence of the efficacy of lavender on depression levels on the grounds that there was no evidence of publication bias, and the quality of studies showed no evidence of impact

on the observed effect.

Limitations

To ensure study quality, we synthesized only RCTs on the effect of lavender on anxiety and depression; however, the risk of bias assessment showed that of all 37 studies included in quantitative analysis, 16 were rated as some concern of risk, and five studies were evaluated as high risk of overall risk of bias. Only 16 of 37 studies were at low risk of bias. Outcomes such as self-rated anxiety or depression can be influenced by outcome assessor's knowledge of intervention received. Therefore, our results on anxiety and depression could have been influenced by participants' knowledge of the intervention received, for example, inhalation of lavender or massage using lavender oil.

Although the evaluation of publication bias in our quantitative analysis showed no evidence of risk of bias across studies, in our review process, we included only studies written in English, published reports, and accessible reports based on preset inclusion criteria. These limits in the locating and screening process might have introduced sampling bias.

Conclusions

Our meta-analysis confirmed the results of existing reviews on the effect of inhalation and massage applicating lavender essential oil for a significant decrease in anxiety levels, although the magnitude of the effect varied slightly. The effect of silexan also confirmed a significant anxiolytic effect of previous evidence.

The effects on physiological parameters, including DBP, heart rate, and salivary or serum cortisol, showed small in effect sizes and no evidence of significant effects. Only systolic blood pressure displayed significant small effect size. The statistical power of the analyses on physiological parameters might be weak because of overly small samples, and the magnitude of effects was small. Therefore, more and larger randomized trials testing the effect of lavender aromatherapy for anxiety measured with physiological measures including vital signs or cortisol are recommended.

Our analysis on the effect of the application of lavender for the treatment of depression demonstrated a beneficial effect on decreasing depression. The effect size on depression cannot be compared with the literature because published data on this topic could hardly be located. Our review included any type of participant, method of intervention, or outcome measure in primary studies investigating the efficacy of lavender aromatherapy. We recommend future reviews focusing on populations in specific health conditions and routes of application of lavender.

Conflict of interest

No potential or any existing conflict of interest relevant to this article was reported.

Appendix A Supplementary data

The following is the Supplementary data to this article:**Multimedia component 1**Multimedia component 1

Appendix A Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anr.2021.11.001.

Moderators/subgroups	k	Hedges' ĝ	95% CI	Qb (df)	pb
Route of administration					
Massage	5	−0.60	−1.02, −0.18	3.35(2)	.187

Inhalation	21	−0.83	−1.03, −0.62		
Silexan 80 mg	4	−0.41	−0.84, 0.03		
Meta-regression	QM(df = 2) = 3.35, p = .187				
	R^2 (amount of heterogeneity accounted for): 6.5%				
Health condition of populations					
Patients undergoing surgery or invasive	13	−0.79	−1.05, −0.53	5.63(3)	.131
Patients with coronary disease or in ICU	7	−1.00	−1.35, −0.64		
Healthy population	6	−0.53	−0.90, −0.15		
Anxiety or depression	4	−0.41	−0.83, 0.02		
Meta-regression	QM (df = 3) = 5.63, p = .131				
	R^2 (amount of heterogeneity accounted for): 8.9%				
Overall risk of within-study bias					
Some concern	14	−0.81	−1.08, −0.53	0.68(2)	.713
Low	11	−0.64	−0.93, −0.34		
High	5	−0.74	−1.20, −0.28		
Meta-regression	QM (df = 2) = 0.68, p = .713				
	R^2 (amount of heterogeneity accounted for): 0.0%				
Sessions of intervention					

Meta-regression	QM(df = 1) = 3.68, p = .055					
	R^2 (amount of heterogeneity accounted for): 13.2%					
Overall effect	k	Hedges' ĝ	95% CI	Q (df)	p	I^2

Moderator/subgroup	k	Hedges' ĝ	95% CI	Qb (df)		pb
Route of administration						
Inhalation	3	−0.42	−0.77, −0.08	0.95(3)		.814
Tea	2	−0.32	−0.76, 0.12	Massage	2	−0.63
−1.08, −0.17	Silexan 80 mg	3	−0.42	−0.72, −0.12	Meta-regression	QM(df = 3) = 0.95, p = .814
	R^2 (amount of heterogeneity accounted for): 0.0%					
Overall effect	k	Hedges' ĝ	95% CI	Q (df)	p	I^2

DETAILS

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Effects of a Thermoelectric Element Band on Venipuncture-associated Pain and Anxiety: A Randomized Controlled Trial

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ABSTRACT (ENGLISH)

SummaryPurpose

Venipuncture is an invasive procedure for diagnosis and treatment, which is often attributed to pain and anxiety. In this study, a thermoelectric element (TEE) band was developed to apply heat therapy (40~45°C), cold therapy (0~10°C), or thermal grill illusion (TGI) therapy (40~45°C, 0~10°C) to cause an illusion of pain by simultaneously applying heat and cold. This band was subsequently used to investigate its effect on patient pain, anxiety, and satisfaction.

Methods

This was a randomized controlled study. Participants, who were to undergo venipuncture, were randomly assigned to the heat therapy, cold therapy, TGI therapy, or control groups. Each group had 30 participants. The interventions were employed for 10 seconds during venipuncture, and the pain, anxiety, and satisfaction were measured before and after the procedure.

Results

Subjective pain, anxiety, and physiological responses after TEE band intervention were not significantly different between the four groups. However, there was a significant difference in satisfaction ($F = 4.21$, $p = .007$) between the four groups, and the cold therapy group showed the highest satisfaction.

Conclusion

In this study, when heat, cold, and TGI therapy were applied with a TEE band, pain and anxiety relief effects were not confirmed, but satisfaction was high. TEE band is a newly developed product that can easily apply hot and cold treatments without using ice packs or hot water packs. Further studies with various individual characteristics of chronic pain or repeated venipuncture are warranted to evaluate the effect of TEE.

FULL TEXT

Introduction

Venipuncture is an essential process in the examination and treatment of individuals in various healthcare settings. It involves the access of a vein for obtaining blood samples and intravenous medication administration for a quick onset of action. Venipuncture is, however, often also a source of anxiety and pain [1,2]. Attempting this procedure on hard-to-find veins has been associated with increased psychological pressure and workload on the staff [2]. Consequently, the novel job position of the “intravenous (IV) nurse,” whose work scope includes IV care (including peripheral IV injections and blood draws), was created to alleviate the patients' pain and anxiety associated with venipuncture and to boost the nurses’ job satisfaction [3]. Therefore, pain relief associated with venipuncture is an important topic of interest, requiring simple and effective methods to relieve both the psychological (fear, anxiety) and physical aspects of this procedure.

Pain serves as both a warning for potential danger as well as an index of recovery. Despite these positive aspects, pain itself is an unpleasant experience, which coupled with psychological torment, such as anxiety and fear, is further aggravated. Nursing interventions are, therefore, mostly focused on pain and anxiety relief, since the two are closely related to each other [4]. The gate control theory can explain the relationship between pain and anxiety. This posits that a pain sensation can increase or decrease during the process in which the pain stimulus travels up the nerve fibers along the pain pathway. At this point, psychological factors, such as cognition, motivation, and emotional state, affect the stimulation of the large fibers (A-beta fibers) of the spinal cord and alter the experience of the pain stimulus [5].

Based on this understanding, many studies have explored nursing interventions, which are effective at alleviating the pain and anxiety associated with punctures and injections. Previous studies have included children vulnerable to pain [6–8], patients undergoing hemodialysis requiring punctures regularly [9–13], and patients with diabetes mellitus who undergo regular insulin therapy [14]. Nursing interventions that have been studied include heat and cold therapy [15,16], topical anesthetic cream [6,7,12], distraction therapy [8], aromatherapy [9], and vibration therapy [17,18], all of which have been reported to be effective in pain relief. However, topical anesthetics and aromatherapy are limited in terms of systemic absorption through the skin and the onset of action. Additionally, few studies have attempted to reduce the pain and anxiety associated with venipuncture in adults [17,18], since venipuncture is considered a simple procedure that causes only temporary pain. However, nurses who perform venipuncture are responsible for the patients' sense of wellbeing. Therefore, it is important to continuously strive to identify effective methods of pain and anxiety relief in patient care.

Among the various simple, independent, nursing interventions conducted to relieve pain and anxiety, heat and cold therapies are effective [10]. Heat therapy effectively relaxes the muscles and lowers the pain by increasing the rate of blood flow [15], while cold therapy reduces pain by decreasing the rate of nerve conduction and increasing the pain threshold [19]. Healthcare facilities may have different techniques for heat and cold therapies, which use gel packs, ice cubes, and heat pads [15,19]. Nurses, while remaining within their specialty of patient care, need to expand the scope of independent nursing interventions, as well as to keep abreast of medical technological advances to utilize effective devices for patient care.

A thermoelectric element (TEE) is a module that converts heat energy into electric energy or vice versa. TEEs can be easily used for heating and cooling and are currently utilized in a wide range of appliances and products used in daily life, including cold water dispensers, cooling car seats, and heating and cooling beauty products. Owing to the recent development of a flexible TEE, the range of potential applications has expanded. In this study, we developed a TEE band for the easy application of heat and cold therapy during nursing interventions. This TEE band contains a flexible TEE plate inside the band, and heat and cold can be applied by pressing a button on the power unit. Further, we applied thermal grill illusion (TGI), which simultaneously applies warm and cool stimuli to trigger a sensory illusion of pain relief.

In 1896, Torsten Thunberg first described TGI as the sensation resulting from the simultaneous application of warm and cool stimuli to the skin [20]. The TGI device causes an illusory sensation of pain at a temperature that does not actually cause warm or cool injuries to the body [21], and paradoxically has been reported to be effective in reducing pain [22], particularly neuropathic and chronic pain [23,24]. We decided to investigate whether TGI application would be effective in reducing the level of acute pain experienced during venipuncture.

This study, therefore, aimed to examine the pain and anxiety-relief effects of a flexible TEE band generating instant heat, cold, or TGI therapy during venipuncture, and to determine the patients' satisfaction with it to explore the device applications in various healthcare settings.

Methods Study design

This study was a randomized controlled trial, designed to evaluate the effects of a TEE band applied during venipuncture for a blood test at a healthcare center. The participants were divided into either a control group, who wore a TEE band without any intervention, or into one of the following intervention groups: the heat, cold, or TGI therapy (simultaneous heat and cold stimuli) groups (Figure 1).

Participants

The participants were recruited from among adults requiring venipuncture for blood tests. The inclusion criteria were 1) aged 20–75 years, 2) history of venipuncture in the past 6 months; a study comparing recalls of pain experiences found that recalling a previous pain experience within 6 months accurately remembered pain and emotions with no difference [25], and 3) no wound present at the venipuncture site. Individuals who were consuming drugs that could have influenced the pain and/or anxiety measures, and those who were incapable of effective communication were excluded.

The sample size was determined using the G-power 3.1.9 program. The calculation parameters were four groups,

an effect size of 0.3 [17], an α value of 0.05 and power of 0.80, which resulted in a sample size estimate of 111. Consideration a potential withdrawal rate of 10%, we recruited 120 participants for this study. In order to prevent allocation bias, random numbers were generated using Excel's random number generation function before recruitment, and information on each allocation group was placed in a clear envelope and arranged in an orderly manner. Participants were recruited using a recruitment poster as per the recruitment list, the author (HC) opened the envelope and assigned each person accordingly to the TEE-H, TEE-C, TEE-TGI, and control groups. Either heat, cold, or TGI was applied to the participants by means of the TEE band. In the control group, the TEE band was applied without operating the machine. In the course of the research, the author (HC) operated the machine, while the phlebotomist was unaware of the participant's allocation group; the study participant was not aware of the temperature stimulus until the machine was operated. Thirty participants were assigned to each group, and there were no dropouts; therefore, a total of 120 participants completed the study (Figure 2).

Measurements and instruments

•**1)** *TEE band*

The TEE band refers to a wristband developed for this study (Tegway, Daejeon, South Korea). A flexible TEE plate patented in Korea (10-1989908, 10-1829709, 10-1689308) was inserted in the band (5.5 × 3.5 cm), through which heat and/or cold stimuli could be applied using electric energy by pressing the HOT/COLD button on the power unit.

•**2)** *Subjective pain*

Subjective pain was measured using the Numeric Rating Scale (NRS). The NRS is valid, reliable, and appropriate for pain measurement in clinical practice. It has good sensitivity and generates data that can be analyzed for audit purposes [26]. Pain was measured in centimeters from 0 “no pain at all” to 10 “very severe pain”.

•**3)** *Anxiety*

Anxiety was measured using the NRS. The NRS is also effective in evaluating anxiety because it is validated and self-evaluated by the subjects [27]. In this study, anxiety was measured in centimeters from 0 “no anxiety at all” to 10 “very severe anxiety.”

•**4)** *Physiological response*

Pain induces alterations in the autonomic nervous system. Physiological responses include biological and behavioral reactions to pain. Physiological changes are parameters that support the measurement and evaluation of pain [28]. Among the physiological parameters, pulse rate and oxygen saturation are used as indicators of pain in various studies due to their objectivity, and changes can be quickly and easily measured through pulse oximeter [6, 28–30]. These were determined using the peripheral oxygen saturation rate and the pulse rate, which were measured using a pulse oximeter (MD300 C22, ChoiceMMed).

•**5)** *Satisfaction*

To measure the participants' satisfaction with the TEE band, we developed six preliminary items based on a questionnaire used in a previous study assessing satisfaction [31], and a literature review. The preliminary items were reviewed by an expert panel comprising two nursing professors and three nurses with a minimum of 10 years of clinical phlebotomy experience. After some modifications and improvements, the final version of the questionnaire had 10 items. The content validity of these 10 items was evaluated by an expert panel comprising two Fundamentals of Nursing professors and four nurses with a minimum of 10 years of clinical phlebotomy experience. The content validity index (CVI) for each item ranged from 0.8 to 1.0, with a mean CVI of 0.98. The 10 items used to assess satisfaction were rated on a five-point Likert scale, with a higher score indicating greater satisfaction. The reliability

(Cronbach's α) of the tool was .87 in this study.

Interventions Thermoelectric band development

A TEE is a module that converts heat energy into electric energy and vice versa. TEE is effectively used to produce electricity with heating and cooling features, especially in thermoelectric cooling equipment and parts [32]. While TEE has been utilized in healthcare for heat and cold therapies, the firm and flat structure of the device hinders the immediate expression of cool and warm sensations. A flexible TEE was therefore developed with small pieces of thermoelectric chips to address these shortcomings. This flexible TEE is lighter than a firm TEE and features a rapid temperature response, making it convenient for application on curved body parts, such as a wrist, to provide warmth, cold, and simultaneous warm and cold stimuli instantly.

We utilized this flexible TEE to administer heat and cold therapy to patients since these are independent nursing interventions used in venipuncture. We developed the TEE band through several rounds of discussions with venipuncture experts and flexible TEE developers, focusing on the shape of the band, application method, temperature settings, and patient convenience (Tegway, Daejeon, South Korea) (Figure 3). The TEE band, which was designed to be wrapped around the skin, contains a 5.5 × 3.5 cm flexible TEE plate within.

The appropriate temperature for thermotherapy for pain-control is based on the contents presented at an average of 41.22 ± 9.77°C according to the literature review [10,17]. To identify the most effective and safe temperature for cold therapy based on previous randomized controlled trial studies, ice packs of −4 to 4°C and cooling gel packs of 0 to 10°C were recommended [19,33]. This study also aimed to induce TGI in terms of the most suitable degree of temperature difference between the simultaneous cold and warm temperatures. Smaller differences (e.g., 10–15°C) are sufficient for illusory heat, while larger differences (e.g., ≥20°C) are required for illusory pain sensations [34]. To summarize, the TEE band set the temperature for heat and cold therapy at 40~45°C and 0~10°C, respectively, to prevent skin burns or other injuries.

Data collection and procedures

Participants were recruited, using a recruitment poster, from a population of adults who were required to undergo a blood test with venipuncture during a health examination from March to April 2021. The volunteers were explained that they would have to wear a wristband during the venipuncture and that the stimulation received would not cause skin damage. All the participants signed an informed consent form prior to participating in the study. The participants completed a questionnaire to gather information on the general characteristics and perceived pain and anxiety experience during their previous venipuncture. Additionally, their peripheral oxygen saturation and pulse rate were measured using a pulse oximeter.

Venipuncture was performed with the participants sitting comfortably in an environment maintained at 23~25°C. A consistent treatment stimulus was maintained to minimize the error in the experiment, and the puncture site was set to the antecubital fossa for all the participants; syringes with the same needle size (5 cc, 22-gauge) and identical serum separator tubes were prepared. A single nurse with more than 5 years of clinical experience was designated the phlebotomist in order to prevent any variability in the characteristics of the experimenter and puncture skills; the phlebotomist was blinded to participant allocation.

We placed the allocation number results, which were generated using the randomization function of Excel and created by the investigator, in a sealed envelope stored in a drawer. Prior to the experiment, each participant was given an allocation envelope to open, at which point we checked the participant's group allocation. Group allocation was written in numbers; thus, both the participant and the phlebotomist were blinded to the assigned number and could not anticipate group assignment. When the phlebotomist was ready for venipuncture, we wrapped the TEE band around the wrist of the patient's arm such that the plate was in close contact with the skin, 10 s of the

corresponding stimulus was provided: heat (40~45°C), cold (0~10°C), or TGI (simultaneous administration of 40~45°C and 0~10°C). The participants of the control group wore the TEE band but did not receive any stimulation. We turned on the power unit and 10-s timer as soon as the phlebotomist had pulled the skin tautly below the needle injection site such that the corresponding stimuli would be generated. The phlebotomist inserted the needle, collected the 5-cc blood sample, and then removed the needle. The entire process took approximately 10 s. We turned off the power unit of the TEE band following the completion of the 10-s timer. Immediately after needle removal and stimuli elimination through the TEE band, we measured the participants' peripheral oxygen saturation and pulse rate using the connected pulse oximeter and removed the TEE band. The participants were subsequently asked to complete the questionnaires regarding their perceived pain and anxiety following the venipuncture, and their satisfaction with the TEE band.

Data analysis

Data were statistically analyzed using the IBM SPSS Statistics 26.0 software. The participants' general characteristics and dependent variables were analyzed as the frequency, absolute number, percentage, and mean with standard deviation; homogeneity was tested using the χ^2 test and one-way ANOVA. The effects of the TEE band were analyzed using ANOVA. Significant results (*p*

Ethical considerations

This study was approved by Institutional Review Board at Eulji University (Approval No. EU21-001), and the protocol was registered with a clinical trials registry (KCT0006176) before any data were collected. We explained the purpose of the study and informed the participants that the collected data would only be used for research purposes and that they were free to withdraw from the study at any time. All the participants signed the written informed consent form. Participants were provided approximately $10 as a token of appreciation for their participation.

Results Baseline homogeneity

A total of 120 participants who were divided into four groups of 30 as heat therapy, cold therapy, TGI therapy, and control groups. The baseline homogeneity of the four groups was no statistically significant differences in sex, age, height, weight, exercise, baseline pain, anxiety, peripheral oxygen saturation, or pulse rate (Table 1).

Effects of the TEE band on variables with venipuncture

- **1)** *Subjective pain*

There were no significant differences in subjective pain among the four groups (F = 1.69, *p* = .173) (Table 2).

- **2)** *Anxiety*

There were no significant differences in anxiety among the four groups (F = 1.16, *p* = .327) (Table 2).

- **3)** *Peripheral oxygen saturation*

There were no significant differences in peripheral oxygen saturation among the four groups (F = 1.05, *p* = .375) (Table 2).

- **4)** *Pulse rate*

There were no significant changes in pulse rate among the four groups (F = 1.17, *p* = .324) (Table 2).

Effects of the TEE Band on satisfaction with venipuncture

Satisfaction significantly differed among the four groups (F = 4.21, *p* = .007), with the TEE-C group expressing the highest satisfaction compared to the control group, as confirmed by the post-hoc test (Table 2).

Discussion

This study aimed to investigate whether a TEE band developed with flexible thermoelectric modules generating heat, cold, and simultaneous heat and cold stimulation would improve the pain, anxiety, and satisfaction in adults

undergoing venipuncture. Our study results demonstrated that providing cold therapy with the TEE band during venipuncture resulted in the highest satisfaction, and greatest intention to reuse the device. Previous studies have reported that cold therapy reduced pain during injections and was associated with the highest satisfaction [17,31]. Although previous studies applied cold therapy for 1–13 min for a puncture [11,17], our results confirmed that even a short application of 10 s resulted in satisfaction, a finding which could help enhance the efficiency of cold therapy in clinical practice.

We examined the pain-relief effects of TGI generated using the TEE band during venipuncture. In a previous study, TGI has been confirmed to reduce the pain in patients with persistent pain [23,24]. However, no previous study has examined the effects of TGI on pain during venipuncture. We hypothesized that TGI would be effective in reducing acute pain such as that associated with venipuncture. This was based on the findings that electric stimulation produced by devices, such as an electromyogram, effectively reduced pain by increasing the pain threshold and reducing the pain awareness [35], and that massaging the injection site using pressure following an intramuscular injection also effectively reduced pain [36]. Furthermore, as described by the gate control theory, pain can be controlled by activating the large fiber that will close the gate of the spinal cord and inhibiting the transmission of pain information through small fibers. We, therefore, hypothesized that heat and cold sensations would stimulate the muscle fibers and thus relieve pain. Thus, we designed the TGI by simultaneously generating heat and cold stimuli using the TEE band and we developed a prototype of the TEE band. However, TGI did not reduce pain and anxiety during venipuncture in this study. We speculate that pain was not controlled since the simultaneous heat and cold sensation is a novel sensation, and hence, the body may fail to distinguish between the heat and cold stimuli and therefore fail to close the gate that inhibits pain. Another possibility may be that the intended sensation was not delivered to the participants owing to the differences in skin thickness and sensory processing. Hence, further research is needed to identify the optimal TEE band temperature settings to produce the ideal TGI for each sex and age group.

Also, the post-intervention reduction in pain and anxiety was not significant. This is consistent with previous findings [16,17] and can be attributed to the different properties of anxiety across individuals. In addition, the participants of this study were healthy adults aged 20-75 years, the age range was too wide, and the baseline for pain and anxiety were relatively low, so it seems that the appropriate effect could not be confirmed. Furthermore, the TEE band developed in this study is only a prototype with a focus on the functional aspect rather than the esthetical quality. Therefore, the application of an emotional design to relieve anxiety could help alleviate the participants' psychological anxiety during invasive procedures and facilitate the treatment process [37]. Hence, attractive and emotionally appealing design components would also be essential when developing devices for use in patients in healthcare facilities.

Generally, the sympathetic nervous system is stimulated in the early phase of acute pain, which in turn increases the pulse rate and oxygen demand; these parameters are widely used as markers of pain and anxiety owing to their objectivity [28]. In our study, there was no significant difference in the post-intervention period concerning peripheral oxygen saturation between the four groups, since 10 s was not sufficient for appearance of changes in the peripheral oxygen saturation. In addition, the other physiological response variable, pulse rate, did not show a significant difference, as in a previous study [7,9,30]. These results show that an insignificant physiological response may be insufficient to indicate pain. We, therefore, need to assess more than the physiological response variables.

Heat, cold, and TGI stimuli application with a TEE band is a novel intervention; hence, we interviewed some participants following the experimental treatment. A participant who received cold therapy stated that "It felt cold, and I didn't know that a needle was being inserted." A participant who received heat therapy commented that "I felt the needle coming in and it hurt, but I felt relaxed." While heat and cold stimuli were familiar sensations, participants who

received TGI stated that simultaneously feeling heat and cold was an unfamiliar sensation: “It was weird and unpleasant, where it suddenly felt cold and suddenly felt hot” and “I was startled because I had never felt this before.” As shown here, most participants felt the intended sensation after 10 s of TGI generated by the TEE band. Through the interview, both heat and cold therapies applied with the TEE band were effective in reducing pain, and the warmth from heat therapy tended to be more effective than the coolness from cold therapy in promoting psychological relaxation. In this study, heat therapy did not show a statistically significant difference in the reduction of pain and anxiety; however, it was the most effective intervention method experienced by participants during the interview. Moreover, the unfamiliar sensation from the TGI resulted in some individuals experiencing an unpleasant sensation, and thus the pain was not masked at all. Nevertheless, this was the first attempt at using this device in clinical practice and follow-up research is required to further evaluate this method.

Our study has some limitations. First, we compared the pain level during venipuncture by selecting healthy adults without disease who had venipuncture experience within 6 months. Considering that there are individual variations in pain, the pain and anxiety of venipuncture within 6 months were measured by memory of the previous venipuncture experience. In addition, since the TEE band was first created to relieve the pain of venipuncture, it was not possible to reflect individual characteristics by setting the temperature in advance as a pilot study. In addition, there was no study applying TGI to venipuncture; hence, it was difficult to compare the pain relief effect of TGI to venipuncture. Considering the individual variations in pain, a follow-up study is warranted to target patients who are repeatedly punctured, and it is necessary to investigate the effects on pain and anxiety after applying a TEE band that reflects the individual characteristics.

Conclusion

This study showed that heat, cold, and TGI stimuli application with a TEE band is a novel intervention. It is important to apply nursing interventions to reduce venipuncture-associated pain and anxiety, and efforts are warranted for convenient application. Since pain and anxiety are subjective measures, they differ across individuals. Hence, heat, cold and TGI therapy to relieve pain and anxiety should be tailored to individual characteristics and preferences. The TEE band composed of TEEs, which have been commonly used in daily life, was developed as a novel TEE band that can be used in healthcare. The TEE band developed in this study is safe because the electric energy delivers a consistent temperature to the user, and the hot and cold settings can be switched easily using the hot and cold buttons, allowing users to choose their preferred setting. Since TEE band is a newly developed product that can easily apply hot and cold treatments without using ice packs or hot water packs, it is necessary to conduct research to devise more application methods for effective use in patient care.

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Conflict of interest

The authors have no conflicts of interest to declare.

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Variables	Category	TEE-H (n = 30)	TEE-C (n = 30)	TEE-TGI (n = 30)	Control (n = 30)	χ^2/F	p

Mean ± D or N (%)	Mean ± SD or N (%)	Mean ± SD or N (%)	Mean ± SD or N (%)	Gender	Female	23 (76.7)	24 (80.0)
22 (73.3)	26 (86.7)	1.77	.622		Male	7 (23.3)	6 (20.0)
8 (26.7)	4 (13.3)			Age (yr)		28.40 ± 12.28	26.10 ± 10.59
24.43 ± 8.44	27.83 ± 11.94	0.81	.490	Height (cm)		163.67 ± 6.16	163.10 ± 5.96
164.21 ± 6.81	161.33 ± 7.18	1.09	.356	Weight (kg)		61.77 ± 11.44	60.10 ± 10.90
60.92 ± 12.15	57.38 ± 9.80	0.88	.456	Exercise	None	9 (30.0)	13 (43.3)
9 (30.0)	12 (40.0)	4.19	.652		Often	18 (60.0)	15 (50.0)
15 (50.0)	15 (50.0)				Daily	3 (10.0)	2 (6.7)
6 (20.0)	3 (10.0)			Pain[a] (NRS)		4.07 ± 1.98	4.43 ± 1.77
4.14 ± 2.00	3.82 ± 1.81	0.54	.656	Anxiety[a] (NRS)		3.09 ± 2.55	3.70 ± 2.63
3.12 ± 2.53	3.35 ± 2.42	0.32	.814	SpO2 (%)		98.20 ± 1.28	98.30 ± 1.21
98.10 ± 1.35	98.60 ± 1.19	0.88	.455	Pulse Rate (bpm)		92.43 ± 13.86	85.80 ± 13.90

Variables	TEE-H[a](n = 30)	TEE-C[b] (n = 30)	TEE-TGI[c] (n = 30)	Control[d] (n = 30)	F	p
Mean ± D	Mean ± SD	Mean ± SD	Mean ± SD	Pain (NRS)	3.30 ± 2.28	2.71 ± 2.10
3.96 ± 2.27	3.57 ± 2.14	1.69	.173	Anxiety (NRS)	1.87 ± 1.63	2.03 ± 1.92
2.63 ± 2.52	1.73 ± 1.82	1.16	.327	SpO2(%)	98.20 ± 1.19	98.03 ± 1.00
97.93 ± 1.36	98.43 ± 1.17	1.05	.375	Pulse Rate (bpm)	85.70 ± 11.67	80.23 ± 13.31
86.43 ± 14.27	83.33 ± 16.85	1.17	.324	Satisfaction	32.90 ± 8.09	35.30 ± 9.83

DETAILS

Subject:	Control theory; Physiology; Patients; Cold; Cooling; Pulse oximetry; Clinical trials; Pain; Heat; Aromatherapy; Nursing; Phlebotomy; Nurses; Oxygen saturation; Anxiety; Thermotherapy; Cryotherapy
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ABSTRACT (ENGLISH)

At the conclusion of Volume 15 of the Asian Nursing Research, the Editors wish to express gratitude and appreciation for the support of so many colleagues who have dedicated their time for ANR this year. At the end of this year, we would like to take an opportunity to openly acknowledge all those reviewers who have contributed to the journal’s success. Ahn, Hye Young, ahanaya@eulji.ac.kr, Eulji University - Uijeongbu Campus Ahn, Jeong-Ah, ahnj@ajou.ac.kr, Ajou University Ahn, Jung-Won, jwahn@cau.ac.kr, Chung-Ang University Ahn, Sukhee, sukheeahn@cnu.ac.kr, Chungnam National University Ahn, Sung Yun, syahn@pcu.ac.kr Alkhawaldeh, Ja'far, kawaldehjafar@yahoo.com Antunes, José Leopoldo Ferreira, leopoldo@usp.br, Universidade de Sao Paulo Campus de Sao Paulo: Universidade de Sao Paulo Apkon, Susan D., susan.apkon@seattlechildrens.org, Children's Hospital and Regional Medical Center aydin avci, ilknur, ilknursezera@hotmail.com, Ondokuz Mayis University Bae, Kyungeui, betty3903@hanmail.net BAE, SUN HYOUNG, shyoung@ajou.ac.kr, AJOU UNIVERSITY Bang, Kyung-Sook, ksbang@snu.ac.kr, Seoul National University College of Nursing Bierut, Laura Jean, laura@wustl.edu Brandt,

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FULL TEXT

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Development and Feasibility Test of a Mouth Contactless Breathing Exercise Solution Using Virtual Reality: A Randomized Crossover Trial

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ABSTRACT (ENGLISH)

SummaryPurpose

The purpose of this study was to develop a novel mouth contactless breathing exercise solution based on virtual reality (VR), and to test its feasibility.

Methods

We developed the Virtual Reality-based Breathing Exercise System (VR-BRES), a self-regulating biofeedback breathing exercise with gaming characteristics and a soft stretch sensor. The feasibility and efficacy of the VR-BRES prototype were investigated through a randomized crossover trial. Fifty healthy adults participated in the trial, and their respiratory parameters and user evaluation of the VR-BRES were compared with conventional deep breathing (CDB) exercises.

Results

The respiratory parameters, forced vital capacity (Z = 4.82, 4.95, $p < .001$), forced expiratory volume in one second (t = 6.02, 6.26, $p < .001$), and peak expiratory flow (t = 5.35, 5.68, $p < .001$) were significantly higher during breathing exercises using the VR-BRES. User evaluation was also significantly higher for the VR-BRES in terms of efficiency (Z = 3.86, $p < .001$), entertainingness (Z = 5.00, $p < .001$), and intention to use (Z = 3.22, $p = .001$) compared to CDB. However, there was no difference in convenience between the two methods (Z = −0.90, $p = .369$).

Conclusion

The VR-BRES has the potential to be an efficient breathing exercise solution. We recommend a clinical study that evaluates the effects of the VR-BRES for a certain period of time for people who need breathing exercises.

FULL TEXT

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Developing and Evaluating a Mobile-based Parental Education Program for Preventing Unintentional Injuries in Early Childhood: A Randomized Controlled Trial

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ABSTRACT (ENGLISH)

SummaryPurpose

This randomized controlled experimental study verified the educational effect of a mobile-based parental education program for preventing unintentional early childhood injuries.

Design and Methods

From August 2019 to September 2019, 167 participants were recruited from parenting portal sites and randomly assigned to an e-learning group (n = 59), an electronic document distribution (EDD) group (n = 53), and a control group with no intervention (n = 55). Participants self-reported data regarding their safety knowledge and behavior before and after the experiment. Each intervention group received an e-learning program and electronic educational documents for two weeks and a satisfaction survey. Using an ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, the relevant e-learning contents were developed with the Storyline 360 program. The collected data were analyzed using 1-way ANOVA, 2-way ANOVA, and independent t-test.

Results

Results were as follows: (1) Postintervetion, no significant differences regarding safety knowledge were observed between the e-learning group, EDD group, and control group. (2) Postintervention, statistically significant differences regarding safety behaviors were observed between the three groups: 3.52 ± 0.28 (e-learning group), 3.51 ± 0.28 (EDD group), and 3.32 ± 0.25 (control group) ($F = 10.091$, $p < .001$). (3) No significant differences regarding education-related satisfaction were observed.

Conclusions

The mobile-based educational program for preventing unintentional injuries positively affected safety behavior in this study. Mobile-based parental education programs could contribute toward effectively preventing unintentional injuries in early childhood because many parents can use these without time and space constraints.

FULL TEXT

Introduction

Pediatric nursing aids children in growing up healthy and safe, which ranks highest among parents' wishes for their children [1]. Curious infants and toddlers actively explore their surroundings, but they are egocentric and often lack the cognitive ability to judge risks [2]. Therefore, they can be exposed to unexpected accidents. Although some injuries may be minor, others, including airway obstruction, road traffic injuries, drowning, fire-related burns, falls, and poisonings, can fatally impact children's health [3]. Of 1830 Korean child fatalities in 2016, 270 were deaths from accidents (14.8%). While this number showed a one-third decrease compared to the 2006 figure, every child death is a tragedy that we must strive to prevent [4]. According to an analysis of unintentional childhood injuries submitted by the Consumer Injury Surveillance System of Korea Consumer Agency in 2019, unintentional childhood injuries accounted for 34.2% of total unintentional injuries. These injuries occurred mostly in homes, followed by educational facilities and recreation facilities. In particular, injuries at home accounted for 68.8% of all childhood unintentional injuries. The most common injury causes were slipping, falling, and bumping into things; foreign substance ingestion and burns also occurred frequently [5].

Pediatric nursing practices should consider not only children, but also their families [1]. Parents, who tend to interact most closely with infants and toddlers, often influence their health and well-being the most. Therefore, one of pediatric nursing's essential goals is supporting and guiding parents in taking good care of their infants and toddlers, for which parental education is crucial. Many studies have discussed the positive effects of parental education for preventing unintentional injuries [6–10].

Several related studies have focused on parents, who often play an essential role in preventing unintentional

childhood injuries in the home. These include research measuring knowledge, safety beliefs, and safety practice behaviors to identify related factors; research on parental education program development; and research confirming the effect of parental education intervention [11]. Parental education programs have taken on various forms, including home visits, one-time or multi-session educational interventions, kiosk-based education interventions installed at medical institutions [12], and smartphone applications [13]. Although home-visit education interventions can effectively diagnose and correct home environments, they are expensive and time-consuming; furthermore, such interventions may be limited in scope because parents may not want home visits. Moreover, group education interventions may pose time and distance constraints for busy contemporary parents. The effectiveness of medical institution-based kiosk education interventions can vary depending on the suggested treatment and the medical staff's disposition.
A study analyzing mothers' demands regarding infant and toddler safety-related education [14] indicated that mothers wanted parental education to continuously and effectively provide safety education for their children. Several parental safety education studies have conducted interventions involving group education. In Korea, the Korea Children Safety Foundation provides face-to-face safety education for parents and early childhood education teachers. The Korea Consumer Agency, the local health center, and the National Institute for Lifelong Education regularly publish and distribute booklets regarding this subject. However, as the number of double-income families increases, parents may find it challenging to make time for face-to-face education [15]; an internet based interventions can also allow many parents to avail the educational opportunities, in contrast to on-site education, which benefits only a limited number of people [16].
The world is moving toward a hyperconnected society where all people, objects, and spaces are connected as part of the fourth Industrial Revolution [17]. Thus, parental education using Internet technology could meet future needs by expanding the scope of nursing beyond face-to-face interactions to a mobile medical environment. Mobile-based education provides the advantage of allowing individual parents to choose the intervention time and place based on their own needs. In addition, the widespread use of the Internet and smartphones makes it a cost-effective method for educating a large number of people compared to home visits or group education. There have been few studies that verified the effects of non-face-to-face parental interventions to prevent children's unintentional injuries, except those studies that educated parents through smartphone applications. Therefore, it is necessary to confirm the effect of non-face-to-face parental interventions through further research; this study focused on verifying the effect of mobile-based parental education interventions. E-learning content can be classified into static and dynamic content. Static content consists of pictures and text, wherein interactivity and engagement are limited; in contrast, dynamic content uses video and audio, making user interaction possible [18]. This study divided the intervention group into an e-learning group (Intervention Group 1) and an electronic document distribution group (Intervention Group 2) to compare the e-learning content format differences. The aim was to (1) develop and apply a parent-oriented e-learning program and electronic documents for preventing unintentional injuries to infants and toddlers, and (2) compare the program effect among Intervention Group 1, Intervention Group 2, and the control group.
The study hypotheses were as follows.

- **1)**Hypothesis 1: There will be differences in terms of safety knowledge regarding unintentional childhood injuries among Intervention Group 1 (e-learning group), Intervention Group 2 (electronic document distribution [EDD] group), and the control group.
- **2)**Hypothesis 2: There will be differences in terms of safety behavior regarding unintentional childhood injuries among Intervention Group 1 (e-learning group), Intervention Group 2 (EDD group), and the control group.
- **3)**Hypothesis 3: There will be differences in terms of education satisfaction among Intervention Group 1 (e-learning group) and Intervention Group 2 (EDD group).

Methods Study design

This study utilized a randomized controlled pre and postexperimental design to evaluate parental education

programs for preventing unintentional injuries in early childhood (Supp. Figure 1).

Samples

This study recruited 167 participants between August and September 2019 from parenting portal sites in the Republic of Korea (Momsholic Baby and Bebe House). The participant inclusion criteria were as follows: (1) primary caregivers, including parents or relatives caring for infants and toddlers; (2) availability of Internet access through computers, mobile phones, or tablets; and (3) those who understood the study's purpose and agreed to participate. We used the G* Power 3.1.9.2 program to estimate the sample size. The desired sample size was calculated based on the effect size d = 0.25 (medium), significance level α = .05, and power 1-β = .8 in comparing the three groups [19]. The calculated sample size was 159 (53 in each group). The sample size was determined to be 175, considering a 10% dropout rate. A total of 175 people (60 in the e-learning group, 58 in the EDD group, and 57 in the control group) responded to a pretest. Eight people did not respond to the posttest. Finally, data of 167 participants (59 in the e-learning group, 53 in the EDD group, and 55 in the control group) were analyzed (Figure 1).

Procedure

The study recruitment announcements were posted on the two parenting portal sites (Momsholic Baby and Bebe House). Interested parents were screened through eligibility questions. Those who met the study's inclusion criteria and signed the consent form were provided with access to the online survey site. They were then randomly assigned to Intervention Groups 1 and 2 and the control group using the random redirect tool [20]. Participants were blinded for concealment purposes, so they did not know if they were assigned to an intervention group or a control group.

All participants in Intervention Groups 1 and 2 and in the control group responded to a pretest survey regarding general characteristics and safety knowledge and behavior. After the pretest, Intervention Group 1 (e-learning group) received a link to the e-learning program (e-learning program for preventing unintentional injuries in early childhood: “I am also a safety expert!”), while Intervention Group 2 (EDD group) received a link to a converted PDF file with content from the e-learning program. Participants in Intervention Groups 1 and 2 were asked to learn by themselves for two weeks. No intervention was provided to the control group.

After two weeks, Intervention Groups 1 and 2, as well as the control group, were assessed again for safety knowledge and safety behavior. Intervention Groups 1 and 2 were also assessed regarding their education-related satisfaction. Participants who completed the education programs and both surveys received incentives (gift cards).

Program development: An e-learning program for preventing unintentional injuries in early childhood

This study's intervention was in the form of an e-learning program for preventing unintentional injuries in early childhood; we developed it using the Storyline 360 e-learning development software program (Articulate Global Inc.) [21]. To develop the program, we used the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model [22], which contained five steps: Analysis, Design, Development, Implementation, and Evaluation.

We searched the parenting sites to understand the types of queries parents have about unintentional childhood injuries. The child health question and answers (Q&A) at parent portal site Naver Cafe Momsholic Baby [23] and the knowledge Bebe Q&A [24] at the parenting portal Bebe House included questions about children bumping into furniture corners, trapping fingers in the doors, being scalded in hot water from water purifiers, slipping in the bathtub, and swallowing disposable bandages.

The developed e-learning program reflected our review of extant research and the realistic requirements of contemporary parents with busy schedules. The program introduction provided information regarding the causes of and current statistics for unintentional childhood injuries to induce learning motivation. Furthermore, the program emphasized parents' essential role in ensuring their children's safety and suggested some basic principles for preventing injuries. The program's learning contents were classified based on six common locations: bedroom, living

room, bathroom, kitchen, the outdoors, and car. Each location-based learning content was categorized under suffocation, aspiration, falls, poisoning, body damage, drowning, or burn prevention. Each program screen comprised the core content and made use of simple pictures to enhance the user's ability to understand health information and to allow them to form a clear visual image.

Based on previous studies on educational material development, the current study utilized the following methods to develop its e-learning program:

••using simple everyday words instead of professional terms

••making sentences as short as possible (10–15 words)

••using positive and active voice

••using easy-to-read text font and size

••emphasizing important parts with bold font and circles

••presenting 5–8 lines of textual information per slide

••using simple and straightforward images

We designed an e-learning program for preventing unintentional injuries in early childhood that contained 44 slides with the introduction, prevention methods based on location, and an epilogue. The training time was about 30 minutes; when the program could not be completed within 30 minutes, it offered the functionality of dividing the content so that it could be taken multiple times. The program slides automatically advanced to the next slide after the narration was completed and stopped at the quiz at the end of the session. After the quiz and the feedback, the slide would proceed to the next session.

The introduction of the program included the importance of prevention, statistics related to injuries, parents' role, and basic principles for preventing injuries. The prevention methods based on place included critical points, prevention methods, and a quiz dealing with child safety in bedrooms, living rooms, bathrooms, kitchens, the outdoors, and cars. At the end of the program, users were presented with a content summary, safety-related website links with additional information, and references ([Supp. Figure 2]).

The major program features were as follows: health literacy considerations, latest statistics and news reports in order to motivate learning, two videos (“How to choose safe toys” and “Visiting a bathroom”), 11 interactive quizzes, a presentation of simple and straightforward action methods, and an introduction to child safety products available in the market.

Using Storyline 360 functions, we converted the e-learning program into a PDF format, which was distributed to the EDD group. The converted PDF contained the slides from the e-learning program, excluding its video and audio features.

Instruments Safety knowledge regarding unintentional childhood injuries

Parents' safety knowledge regarding unintentional childhood injuries was measured using a tool developed by Kim et al [25]. This tool contained 20 items that were divided into the following categories: fall, fire, poisoning, suffocation, first aid, play, and burn. Examples of items from the tool include: “What is the best way to prevent poisoning in infants and young children?” and “What is the proper method to install an infant car seat?” The scores for each item were calculated on the following basis: 1 point for a correct answer and 0 points for an incorrect answer (20 points total).

Safety behaviors regarding unintentional childhood injuries

A tool developed by Kim et al. was used to assess parents' safety behaviors in response to unintentional childhood injuries [26,27]. This tool has 40 items and 9 categories: safety measures and coping, drug management, electrical appliance management, fire prevention, burn prevention, parental supervision and education for safety, drowning prevention, vehicle safety, and home environment inspection. Example items are as follows: “I always keep hot electrical appliances out of the reach of children after using them,” “I make sure my child's toys are safe,” and “I do not allow children to play alone near water.” This tool utilized a four-point Likert scale (1 = “not at all” to 4 = “very much”). A higher score indicated a higher degree of safety behavior regarding unintentional childhood injuries. Negative questions were analyzed by processing the reverse questions as positive questions. While in the previous study [27], Cronbach's α was .78, in this study, Cronbach's α was .86.

Education-related satisfaction

Education-related satisfaction was measured using a tool developed by the researcher of the current study. This tool utilized a five-point Likert scale containing eight items, which assessed parents' degree of satisfaction concerning difficulty, motivation, duration of education, technical stability, and achievement level after receiving the e-learning intervention or the electronic documents. Example items from the tool are as follows: “The educational contents were clear and easy to understand,” “The educational contents were interesting and motivational,” and “The educational contents helped to raise awareness of Preventing Unintentional Injuries in infants and young children.” Items were scored as follows: 1 = “not at all” to 5 = “very much”; a higher score indicated a higher degree of satisfaction. In this study, Cronbach's α was .89.

Ethical considerations

The Institutional Review Board of Eulji University approved this study (Approval no. EU19-31). At the time of data collection, participants received explanations regarding the study's purpose, method, and participation withdrawal; thus, the study was conducted with voluntary consent. Participants were assured that the collected data would be used only for research purposes. A serial number would be given to the data after removing personal identifiers in order to ensure protection of personal information. Participant data would be discarded after three years.

Data analysis

The collected data were analyzed using the SPSS 25.0 statistical program. The participants' general characteristics were analyzed using frequency, percentage, mean and standard deviation. Participant's safety knowledge and behavior regarding unintentional childhood injuries were analyzed using the mean and standard deviation. Differences in terms of safety knowledge and safety behavior among the three groups were analyzed using a one-way ANOVA; furthermore, *post hoc* analysis was performed using the Scheffé test and Bonferroni correction method. Differences in terms of education-related satisfaction between the two intervention groups were analyzed using an independent sample t-test.

Results Homogeneity test

A homogeneity test for general characteristics showed no significant difference in terms of gender, age, education level, occupation, number of children, relationship with children, and unintentional injury experiences among the three groups; so, homogeneity among the participants of the three groups was confirmed (Table 1).

The homogeneity test for the dependent variables of the e-learning, EDD, and control groups showed no significant differences in terms of safety knowledge and behavior, hence, the three groups' homogeneity was confirmed (Supp. Table 1).

Hypothesis verification Safety knowledge

The three groups showed no statistically significant difference regarding safety knowledge after the intervention:

15.90 ± 2.25 in the e-learning group, 16.45 ± 2.05 in the EDD group, and 15.85 ± 2.20 in the control group (Table 2). Therefore, Hypothesis 1 was rejected.

Safety behavior

Postintervention, the safety behavior was 3.52 ± 0.28 in the e-learning group, 3.51 ± 0.28 in the EDD group, and 3.32 ± 0.25 in the control group. There were statistically significant differences between the three groups (F = 10.09, *p* Post hoc analysis showed that the e-learning and EDD groups had a statistically significant growth in safety behavior compared to the control group (Table 3, Supp. Figure 3).

Statistically significant differences were observed between the three groups for the following categories: safety behavior, drug management (F = 4.80, *p* = .009), electrical appliance management (F = 6.31, *p* = .002), vehicle safety (F = 7.39, *p* = .001), and home environment inspection (F = 6.88, *p* = .002). *Post hoc* analysis showed that the e-learning and EDD groups had higher safety behavior scores than the control group.

Thus, Hypothesis 2 was supported.

Education-related satisfaction

Satisfaction with education was 4.08 ± 0.58 in the e-learning group and 4.26 ± 0.51 in the EDD group, and there was no statistically significant difference in terms of education-related satisfaction between the two groups (*p* = .097, Table 4). Therefore, Hypothesis 3 was rejected.

Discussion Developing an e-learning program for preventing unintentional injuries in early childhood

The importance of preventing an unintentional injury is often recognized only after the injury. Therefore, it is essential to improve parents' safety awareness and behavior regarding unintentional childhood injuries; proper education is one way to improve such awareness. Since the Internet is available without any location or time constraint, and portable electronic devices are widely used in Korea [28], mobile-based e-learning education is convenient for parents with limited time. It is also more cost-effective than home visits or group education.

E-learning is becoming increasingly popular in school education, professional refresher education [29], and language education [30]; thus, it can satisfy the contemporary educational needs. E-learning has also been recognized for its effectiveness, and is now replacing traditional classroom education [31]. However, since this study's e-learning program was not a compulsory component, we considered the interest of potential users, program interactivity, and health literacy to motivate learning while developing the program.

A study on effective development of health education materials suggested that, when developing educational materials, it is necessary to enable learners to read and understand content easily [32]. In short, users' ability to develop health literacy and understand and use health information by themselves [33] should be prioritized. Furthermore, a study on e-learning content showed that the visual design strategies used for presenting textual information significantly affected users' understanding of textual contents [34].

The parents were introduced to child safety products available in the market. However, unlike the “Make Safe Happen” application developed by the Nationwide Children's Hospital in the United States [13], which uses a link to a vendor and is available for purchase, our program did not list any purchasing information to avoid possible conflicts of interest.

The current program's total required e-learning time was about 30 minutes. The study's program for promoting and developing parental safety education to prevent infants' and toddlers' unintentional injuries [35] included four timeslots of 40–90 minutes of classroom education and six e-mail newsletters. The study's intervention for assessing the effectiveness of parental safety education in preventing childhood unintentional injuries [36] involved offline participation for 3 hours at one time.

A relatively short learning time can be an advantage for those who have little time to spare; however, this can have

the disadvantage of not providing extensive and in-depth learning. The present study's one-time e-learning program emphasized overall knowledge and principles. However, any e-learning program that is provided regularly to learners could be effective for improving learners' in-depth safety knowledge and safety behavior.

Effects of educational intervention

The study results showed that, after experiencing the educational intervention, both intervention groups significantly improved their safety behavior compared to the control group. This finding is consistent with that of another study [10], where an educational intervention positively affected the safety behavior of parents of infants. These results imply that mobile-based e-learning or education using electronic documents and traditional classroom education can improve parents' safety behavior. Therefore, it suggests that an educational e-learning method can fit the lifestyle of people who face the paucity of time.

Regarding safety knowledge, no statistically significant difference was observed between the e-learning group, the EDD group, and the control group. This may have been because many of the items measured could be responded through common sense. In addition, the participants who are parenting portal sites users are likely to be highly concerned and aware of parenting issues, including safety issues.

In one study that verified retest validity based on the test type by using general mental ability (GMA), the interval between the test and retest was set at six weeks in order to minimize the testing effect [37]. In the current study, the interval between the pretest and posttest was two weeks, and the same measuring tool was used. Another reason for the absence of a significant difference in terms of safety knowledge may have been that the control group's safety knowledge score increased due to the testing effect. If a testing effect is expected in the study design, it is necessary to increase the test interval or use another tool for retesting.

This study showed that e-learning programs for preventing unintentional injuries in early childhood could help parents improve their safety behavior. Since preventing unintentional injuries could reduce social costs, this could be achieved most effectively if parents of infants and toddlers were obligated to receive unintentional injury prevention education. Such education could be delivered during prenatal care visits at the hospital immediately after childbirth while the parents and babies are staying at the postpartum care center, during a pediatric wellness-check visit, or online. Safety education can be mandatory, however, implementing this may cause various difficulties. Instead, it would be most effective to provide incentives. For example, The Korea National Police Agency operates a mileage system that reduces driver's license penalties for drivers who do not violate traffic laws for one year. Beam Dental Insurance [38] in the United States analyzes dental care data through the provided smart toothbrush and calculates premiums. People who take good care of their teeth will pay fewer insurance premiums. Thus, if users receive appropriate benefits when completing safety education, or when such programs are promoted through public service advertising campaigns, the education completion rate could be increased.

The safety behavior of the EDD group, which used static content produced by converting dynamic content into PDF format, did not significantly differ from that of the e-learning group. This indicates that well-designed educational materials regarding health literacy and motivation were used for the EDD group. Moreover, it is consistent with Chan et al's study, which rapidly disseminated essential information related to COVID-19 using well-designed educational materials in clear and actionable formats [39]. Therefore, we suggest that future studies elaborate the strategies of educational static contents design, which requires relatively less cost, time, and effort than dynamic content.

In this study, both intervention groups were satisfied with the educational intervention; “satisfaction with education” received more than 4 points. This result is consistent with that of a study on parents' need for smartphone-based health education [40], where parents with young children were found to have higher demands for smartphone-based health education than parents with children of other ages. However, no differences in terms of education-related

satisfaction were observed between the e-learning group and the EDD group in the intervention. This could be attributed to the fact that the conversion of e-learning contents into electronic documents can make the relevant content easier to understand; furthermore, some people prefer the form of readable documents to videos. Considering the parents' responses to the open-ended questionnaire, e-learning content could increase education-related satisfaction by subdividing the learning contents based on age, situation, risk factors, shortening of learning time, and regular sending of education links to the target audience.

According to one systematic review of mobile-based health behavior interventions [41], 20 experimental studies out of 34 extracted studies produced significant positive results in terms of health behavior changes. The review study also recommended the use of mobile-based interventions for younger age groups. However, it is necessary to consider using mobile-based education with already familiar methods, such as sending YouTube video links or using a text messaging service for grandparents or older relatives who take care of infants and toddlers.

Since producing e-learning video contents is costly, the distribution of well-planned electronic documents with good visual design and health literacy when educating parents in a mobile medical environment can be a cost-effective method that produces high satisfaction. However, e-learning content that utilizes video is expected to increase educational effect and satisfaction if the demonstration video can enhance the user's understanding of important subjects, including cardiac pulmonary resuscitation (CPR), first aid of fracture and burn, parental training for foreign body aspiration, and proper car seat installing method.

We suggest that further research be conducted on mobile-based programs in order to educate parents about first aid for infants' unintentional injuries and CPR.

Limitations

Despite its contributions, this study has some limitations. First, we recruited participants from parenting portal sites; these parents are likely to be highly concerned and aware regarding parenting issues, including child safety issues. Thus, the study sample may not represent the general population of Korea. Second, as data were collected via the self-report method, the outcomes of this study may be affected by various biases. Therefore, we recommend that future studies include inspection of homes or behavioral measures as measurement strategies. Third, despite our efforts, such as text messaging to encourage participants to use the learning program and incentives, it was challenging to confirm whether the participants had completed the program. Therefore, we suggest utilizing technology to confirm participants' completion of e-learning programs in future research.

Conclusions

The study results showed that the mobile-based education program for preventing unintentional injuries in early childhood did not improve safety knowledge; however, it was proven to increase safety behavior.

If an educational program utilizes this study's results, it can be used as an intervention method for preventing unintentional injuries in early childhood. Mobile-based educational programs, with both static and dynamic content, could contribute to the effective prevention of unintentional injuries in early childhood, as many people can use them without being limited by time and space constraints. Furthermore, this study has prepared primary data that could be applied to expand nursing care from a face-to-face environment to a more mobile-based medical environment.

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Declaration of competing interest

The authors have no conflict of interest to declare.

Appendix A Supplementary data

The following is the Supplementary data to this article:**Multimedia component 1**Multimedia component 1

Appendix A Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anr.2021.12.001.

Variables	Categories	e-learning (n = 59)	EDD (n = 53)	Control (n = 55)	χ^2	p
n (%)	n (%)	n (%)	Age(year)	20–29	11(18.6)	5(9.4)
9(16.4)	3.91	.419	30–39	39(66.1)	41(77.4)	42(76.4)
≥40	9(15.3)	7(13.2)	4(13.2)	Gender	Male	5(8.6)
7(13.2)	4(7.3)	1.20	.549	Female	53(91.4)	46(86.8)
51(92.7)	Education	High school	4(6.8)	4(7.5)	4(7.3)	0.71
.950	College	46(78.0)	38(71.7)	42(76.4)	Graduate school	9(15.3)
11(20.8)	9(16.4)	Job	Homemaker	19(32.2)	19(35.8)	29(52.7)
7.84	.250	Office worker	13(22.0)	9(17.0)	10(18.2)	Professional
17(28.8)	17(32.1)	13(23.6)	Others	10(16.9)	8(15.1)	3(5.5)
Number of children	1	38(64.4)	31(58.5)	38(69.1)	1.32	.516
≥2	21(35.6)	22(41.5)	17(30.9)	Relation	Mother	51(86.4)
43(81.1)	50(90.9)	3.69	.449	Father	6(10.2)	7(13.2)
5(9.1)	Others	2(3.4)	3(5.7)	0(0.0)	Injury experience	Yes

13(22.0)	16(30.2)	17(30.9)	1.40	.498	No	46(78.0)

Variables		e-learning (n = 59)	EDD (n = 53)	Control (n = 55)	F	p
M ± SD	M ± SD	M ± SD	Safety knowledge	Pretest	14.88 ± 3.15	15.40 ± 2.04
15.25 ± 2.00	0.54	.586	Posttest	15.90 ± 2.25	16.45 ± 2.05	15.85 ± 2.20
1.28	.282	Mean difference	1.02 ± 2.82	1.06 ± 1.76	0.60 ± 1.81	0.98

Safety behavior categories		e-learning (=a) (n = 59)	EDD (=b) (n = 53)	Control (=c) (n = 55)	F (p)	Post hoc Scheffé
M ± SD	M ± SD	M ± SD	Total	Pretest	3.36 ± 0.31	3.33 ± 0.29
3.30 ± 0.26	0.60(.549)		Posttest	3.52 ± 0.28	3.51 ± 0.28	3.32 ± 0.25
10.09(<.001)	a, b > c	Mean difference	0.16 ± 0.28	0.17 ± 0.27	0.02 ± 0.17	9.61(<.001)
a, b > c	Safety measure and coping	Pretest	3.12 ± 0.38	3.10 ± 0.37	2.96 ± 0.39	2.75(.067)

	Posttest	3.29 ± 0.39	3.29 ± 0.37	3.04 ± 0.40	7.83(.001)	a, b > c
Mean difference	0.17 ± 0.35	0.19 ± 0.42	0.07 ± 0.26	2.19(.117)†		Drug management
Pretest	3.46 ± 0.46	3.48 ± 0.47	3.53 ± 0.34	0.45(.642)		Posttest
3.60 ± 0.42	3.59 ± 0.37	3.45 ± 0.45	2.30(.104)		Mean difference	0.14 ± 0.41
0.11 ± 0.45	−0.08 ± 0.38	4.80(.009)	a, b > c	Electrical appliance management	Pretest	3.06 ± 0.40
3.10 ± 0.52	3.21 ± 0.47	1.71(.185)		Posttest	3.29 ± 0.43	3.36 ± 0.50
3.22 ± 0.42	1.31(.273)		Mean difference	0.23 ± 0.46	0.25 ± 0.42	0.00 ± 0.33
6.31(.002)	a, b > c	Fire prevention	Pretest	3.43 ± 0.48	3.35 ± 0.45	3.40 ± 0.49
0.36(.699)		Posttest	3.57 ± 0.38	3.42 ± 0.46	3.41 ± 0.44	2.59(.078)
	Mean difference	0.14 ± 0.42	0.06 ± 0.41	0.00 ± 0.21	2.51(.086)†	

Burn prevention	Pretest	3.44 ± 0.47	3.48 ± 0.39	3.46 ± 0.41	0.10(.903)	
Posttest	3.57 ± 0.41	3.64 ± 0.39	3.53 ± 0.42	1.08(.343)		Mean difference
0.13 ± 0.48	0.17 ± 0.47	0.06 ± 0.43	0.67(.511)		Parental supervision and education for safety	Pretest
3.42 ± 0.43	3.39 ± 0.45	3.20 ± 0.53	3.51(.032)		Posttest	3.53 ± 0.39
3.64 ± 0.39	3.24 ± 0.46	13.35(<.001)	a, b > c	Mean difference	0.11 ± 0.44	0.25 ± 0.49
0.04 ± 0.42	3.04(.051)		Drowning prevention	Pretest	3.52 ± 0.50	3.48 ± 0.50
3.32 ± 0.50	2.56(.080)		Posttest	3.65 ± 0.42	3.64 ± 0.43	3.37 ± 0.41
7.96(.001)	a, b > c	Mean difference	0.13 ± 0.44	0.16 ± 0.47	0.05 ± 0.40	0.85(.429)
	Vehicle safety	Pretest	3.58 ± 0.42	3.53 ± 0.33	3.54 ± 0.29	0.34(.709)
	Posttest	3.75 ± 0.30	3.67 ± 0.33	3.49 ± 0.31	10.31(<.001)	a, b > c

Mean difference	0.18 ± 0.39	0.14 ± 0.33	−0.05 ± 0.28	7.39(.001)	a, b > c	Home environment inspection
Pretest	3.18 ± 0.42	3.17 ± 0.53	3.16 ± 0.35	0.05(.950)[†]		Posttest
3.42 ± 0.44	3.39 ± 0.47	3.16 ± 0.38	5.74(.004)	a, b > c	Mean difference	0.23 ± 0.49

Variable	e-learning (n = 59)	EDD (n = 53)	t	p
M ± SD	M ± SD	Satisfaction with education	4.08 ± 0.58	4.26 ± 0.51

DETAILS

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Introduction to the Special Issue: “Nursing Education and Research in the Remote Era”

Kang, Jiyeon

ABSTRACT (ENGLISH)

The increased workload for nurses due to the spread of COVID-19 has pushed back the priority of clinical training for nursing students. [...]nursing students have been removed from clinical practice in some countries where the spread of COVID-19 infection has been severe [3]. First of all, it is essential to establish a good relationship with the clinical team because meeting with patients and their families has become more limited when conducting clinical research [11]. There are various types of digital technology used in nursing practice, and research and most of them report positive effects, but the level of evidence is relatively weak, or the study sample size is small. [...]higher quality studies that can show the effects of digital procedures on nursing care are needed.

FULL TEXT

The spread of severe acute respiratory syndrome coronavirus 2, which started in 2019, reached a pandemic declaration by the WHO on March 11, 2020 [1], and has now penetrated every corner of our lives. As of June 3, 2021, more than 170 million people worldwide have been infected with the coronavirus disease 2019 (COVID-19), and more than 3.7 million have died [2]. The quantitative scale of the number of infected and dead from COVID-19 and related health and medical problems are enormous, and all aspects of society, including the economy, industry, education, research, culture, art, and daily life, have changed since the pandemic. As the importance of social distancing as a strategy to prevent the spread of COVID-19 has been emphasized, the use of online education, electronic payment, and kiosks has skyrocketed along with the words “non-face-to-face” or a newly coined word, “untact.”

Education, like other sectors of society, has changed dramatically since the COVID-19 outbreak. Compared to before, interest in online, non-face-to-face, untact, or remote education has increased overwhelmingly. The COVID-19 pandemic has limited classroom learning and clinical practice, two main components of nursing education. Many nursing schools around the world have closed their campuses and maintain only online classes. The increased workload for nurses due to the spread of COVID-19 has pushed back the priority of clinical training for nursing students. Moreover, nursing students have been removed from clinical practice in some countries where the spread of COVID-19 infection has been severe [3]. A virtual classroom education that enables real-time interaction between students and educators has been proposed to replace training in field practice [4]. In addition, a pedagogical caring framework to humanize virtual classrooms and remote or online teaching have also been offered [5].

The differences in infrastructure for digital access between individuals and institutions have created a new issue of educational disparities. Nursing students experienced a number of difficulties with the abrupt transition from traditional learning to remote learning, especially among students with limited electronic resources [6]. Issues such as teaching and learning gaps, inability to conduct proper clinical assessments and standard operating procedures, and disruption towards professional development have been revealed with respect to clinical practice during the COVID-19 period [7]. These issues will inevitably affect nursing students’ access to learning opportunities and the establishment of a professional identity and nursing roles, eventually threatening the sustainability of the nursing workforce.

Due to the sudden outbreak of the COVID-19 pandemic, many nursing schools were not sufficiently prepared for education and teaching in remote environments. Limited IT infrastructure, digital illiteracy, and lack of human interaction are some of the challenges facing nursing schools and students. However, an advantage of remote learning is the ability to provide equitable learning opportunities across geographic areas and time. In order to reorganize and promote nursing education in this pandemic era of crisis, we need successful innovation and transformation of on-campus learning and clinical site training so that nursing education can fully progress. Specifically, it requires the joint participation of schools and healthcare providers in governance [8] and the pooling of digital and hands-on education resources such as virtual learning environments [9]. In addition, in order to guide changes in the future, there must be a consideration of the principles, philosophy, and theories of remote education.

The COVID-19 pandemic is also having a profound impact on nursing research. Research into the nursing workforce is on the rise, as medical resources and staff redeployment to support COVID-19 critical care is a global

phenomenon. Nursing research to improve understanding of new phenomena, including effective treatment and management of diseases, is also being actively conducted [10,11]. Research in the context of the COVID-19 pandemic has many challenges. First of all, it is essential to establish a good relationship with the clinical team because meeting with patients and their families has become more limited when conducting clinical research [11]. This limitation of access to the field has triggered a digital transformation in nursing research. Researchers are considering non-face-to-face methods such as online or telephone surveys as an alternative to the face-to-face approach. The latest digital technologies, including big data extraction and processing, virtual reality, wearable medical devices, artificial intelligence, and blockchain, have been introduced into the field of nursing research. Their applications in nursing care include hospital information systems, electronic health records, computerized decision support systems, telecare, general communication support, systems to support process planning and/or data exchange, specific applications, and target group-specific interfaces [12]. Digital nursing technologies affect the health, satisfaction, and quality of life of formal and informal caregivers, as well as those in need of care, while influencing the care process, access to care, and communication, and social interaction within healthcare institutions [13]. There are various types of digital technology used in nursing practice, and research and most of them report positive effects, but the level of evidence is relatively weak, or the study sample size is small. Therefore, higher quality studies that can show the effects of digital procedures on nursing care are needed. Meanwhile, a nursing journal club as a means to narrow the gap between research evidence and clinical practice can be implemented virtually, in line with the recent non-face-to-face trend [14].

Since the onset of the COVID-19 pandemic, the basis of nursing education and research has been changing, and not all of these changes are negative. Even after the end of COVID-19, education is more likely to maintain blended learning and education rather than returning to the predominantly face-to-face system of education and learning. Nursing practice and research have begun to embrace new technologies more actively and are expanding their scope and applicability. The framework of nursing research has also been shifting towards collaborative research teams rather than individual research [15]. As nursing educators and researchers, we must lead a successful transition to a new normal, beyond overcoming the crisis, by collecting and sharing the changes accelerated by the pandemic.

Asian Nursing Research journal has planned a special issue to prepare for changes in nursing education and research after the pandemic and to guide schedules and timelines of transition. The theme of this special issue is “Nursing Education and Research in the Remote Era.” We would like to share with our readers the needs, interests, new knowledge, experiences, and perspectives on the following topics: education technology and electronic platforms to support non-face-to-face education, systems and technologies to support nursing care during the COVID-19 crisis, development, and application of nursing interventions to support non-face-to-face nursing care, and mobile or smartphone applications to manage COVID-19-related situations.

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Factors Associated with Behaviors Toward End-of-life Care Among Chinese Oncology Nurses: A Cross-Sectional Study

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ABSTRACT (ENGLISH)

SummaryPurpose

The goal of this study was to describe the current status of oncology nurses' behaviors toward end of life (EOL) care in China and to explore the factors associated with oncology nurses' behaviors toward EOL care.

Methods

A cross-sectional design was applied and a convenience sample of 1038 oncology nurses from 22 grade A hospitals were recruited into this study. A general social demographic data questionnaire was administered, and the Chinese version of Nurses' Behaviors of Caring for Dying Patients Scale was used to assess nurse behavior toward EOL care. The total score ranges from 40 to 200 points. Data were analyzed with SPSS 26.0 software.

Results

Chinese oncology nurses' average score of holistic EOL care behaviors was 2.97 ± 0.59. Oncology nurses provide physical care most (3.81 ± 0.76), followed by family care (3.02 ± 0.86), and spiritual care (2.37 ± 0.67). Multiple regression analysis showed that a higher frequency of sharing EOL care experience with colleagues, in-service palliative care education, higher level of head nurse support for EOL patient care, more cases of EOL care, higher working position, and nurse's perceived high level of support were positively associated with behavior toward EOL care. These six factors explained 16.2% of the total variance.

Conclusions

The results may help provide a basis for converting behavior for EOL care among oncology nurses and design interventions to better improve quality of life for EOL patients with cancer in China.

FULL TEXT

DETAILS

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Risk Factors Preventing Immediate Fall Detection: A Study Using Zero-Inflated Negative Binomial Regression

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ABSTRACT (ENGLISH)

Purpose
Falls are the most common accidents in healthcare facilities, and timely intervention can have a positive effect on the hazards and trauma experienced by patients after a fall. This study determined the factors affecting the time taken to detect a fall.
Methods
A total of 3,470 cases of falls reported through the Korea Patient Safety Reporting and Learning System were included in the analysis. A zero-inflated negative binomial regression method was used for this retrospective secondary data analysis study.
Results
There were 537 patients whose falls were not detected immediately; the count model was used to predict risk factors that delayed fall detection. Women aged 60–69 years—compared to those below 60 years and an evening nursing shift, compared to a day shift—were identified as significant factors. The fall detection time of about 2,933 patients was zero; therefore, the logit model was applied to predict a patient's possibility of belonging to the group whose fall was detected immediately. Comparisons of tertiary hospitals with general hospitals and hospitals, of the evening shift with the day shift, and of the day shift with the night shift indicated significant influencing factors.
Conclusions
These findings can assist nurses in recognizing patient and hospital characteristics related to delayed fall detection. Strategies to improve patient safety in healthcare facilities that focus on patient characteristics such as age can be recommended. Furthermore, nurse staffing requires improvement to detect fall incidents immediately.

FULL TEXT

Introduction

Falls are the most common accidents among hospitalized patients [1,2]. In acute-care US hospitals, approximately three to five falls occur per 1,000 patient bed days [3,4]. In a 2013 study of Korean general hospitals with over 500 beds, fall rates were high at 3.87 cases per 1,000 discharged patients per year and 0.55 cases per 1,000 patient days [5]. Timely fall detection enables patients to receive appropriate treatment within a shorter period [6]. Thus, rapid fall detection and prompt response are paramount [7] and may minimize the aftereffects of a fall, such as emotional anxiety and fear of falling again. Notably, most falls occur at night when the lighting is dim, and patients may feel that it is burdensome to ask a nurse for help [8,9]. Falls increase patients' morbidity, mortality, hospitalization days, and healthcare costs [10]. Even without injuries, falls can trigger fear, anxiety, stress, and depression, which can have various adverse outcomes, such as a reduction in physical activity [11]. Accordingly, the ongoing effort is being directed toward developing various strategies and interventions to reduce the prevalence of falls from a nursing perspective [11].

Swift fall detection—in addition to the development of interventions—may reduce the risk of adverse outcomes. If a fall occurs, the nurse may not become aware of it immediately, and the patient may perceive that it is their fault. Thus, the patient may refrain from notifying the medical staff of such accidents. Despite the importance of prompt fall detection and response, previous studies have focused on reporting the actual number of falls and identifying their contributing factors. Few studies have investigated the importance of timely fall recognition and response by medical staff, including nurses. The opportunity for appropriate patient treatment decreases when there is a delay in fall detection, which is potentially detrimental to overall patient outcomes. Thus, there is a need for studies focusing on this issue.

A study investigating accidental falls found that the level of registered nurse (RN) staffing in a medical unit is positively correlated with the number of unassisted falls [12]. This finding implies that the allocation of nurses is a key factor. A systematic review explained the components of fall prevention programs that emphasized assessment, supervision, and assistance with transfer and toilet use and that these factors were related to sufficient nurse staffing level [13]. In South Korea, the standard for patients per RNs in tertiary hospitals, general hospitals, and hospitals is 2.5 or less, and the proportion of general hospitals (including tertiary hospitals) meeting the standards was 63%, whereas only 19% hospitals met the standard, which means that the allocation of nurses differs based on the type of

medical institution [14]. Thus, the appropriate response to accidents such as falls and the measures for prompt detection and treatment may differ accordingly.

There may be differences in the occurrence of adverse fall outcomes depending on where and at what time the fall occurred during the nursing shift. In the hospital room, intensive-care unit, emergency room, and other locations, the medical staff may have different time limits to confirm a fall accident. This difference may be due to varying nurse allocations, the severity of the patient's condition, their duration of hospitalization, and work shifts. Indeed, considerable patient movements occur during the day and evening shifts. Conversely, most patients are asleep during night shifts. Accordingly, there are relatively fewer nurses on duty during the night shift, and they tend to spend more time at the nurses' station. In such cases, it would plausibly take them longer to identify adverse outcomes.

It should be noted that no study has thoroughly investigated the influence of these factors on fall identification. Moreover, there is no information regarding what improvements are necessary to facilitate a rapid response to falls. Therefore, the present study analyzed the time taken to detect a fall in relation to factors such as the type of Korean healthcare facility, fall location, and medical staff's working shift. Apart from determining the factors influencing the time taken to detect a fall, this study considered the improvements required for immediate fall detection.

When the Patient Safety Act was enacted in July 2016, the Korea Patient Safety Reporting and Learning System (KOPS) was introduced to systematically collect data regarding patient accidents. The KOPS reports patient accidents in medical institutions. These data are available to the public on the KOPS website of the Korea Institute for Healthcare Accreditation (KOIHA), which is tasked with promoting both public awareness and the quality of care provided in medical institutions. This study utilized the KOPS data for 2018 to investigate the impact of these characteristics on the time lag between fall occurrence and discovery. This information could facilitate the development of enhanced preventive measures. Particularly, there could be future discussions regarding nursing interventions based on the factors that influence the time taken to detect falls.

This study aims to (1) examine the differences in fall severity related to the time until fall detection, (2) compare the time taken to detect falls in different healthcare facilities according to the specific type of medical institution and patient characteristics, and (3) verify the factors that affect the time taken to detect a fall.

Methods Design

This retrospective study utilized secondary KOPS data on patient accidents at medical institutions. The data are available to the public through the KOIHA.

Sample and setting

Raw data on patient safety/accident cases reported to the KOPS were downloaded from the KOIHA website on 30 November 2020 [15]. The fall incidents occurred in 2018 were included and the incidences at psychiatric hospitals and Korean medicine hospitals and the cases with missing information were excluded in analysis. Among 9,250 patient safety incidents, of which 8,483 cases had occurred in 2018 and 3,906 were fall incidents. Moreover, 85 incidences at psychiatric hospitals and Korean medicine hospitals were excluded because of heterogeneity of hospital type, and 351 cases with missing information concerning the accident occurrence and discovery times were also excluded. Finally, 3,470 cases were included in the analysis. This study conceptualized a fall as a sudden and unintentional change of posture, to a place lower than the current body position, causing the individual to sit or lie on the floor. Information such as the patient's gender and age was included in this study; however, personal identifiable information was excluded. Furthermore, the type of medical institution, location of each fall, time of occurrence, and time of identification were included.

Measurements

The gender and age of the patients who experienced falls were classified on a nominal or ranking scale. Healthcare facilities were categorized as tertiary hospitals, general hospitals, hospitals, and long-term–care hospitals. Each fall was categorized in accordance with the incident location as follows: patient room and intensive-care unit, emergency room, examination room, injection room, treatment room, outpatient room, and others (e.g., operation room, recovery room). Fall times were classified as 7 a.m. to 3 p.m. (day shift), 3 p.m. to 11 p.m. (evening shift), and 11

p.m. to 7 a.m. (night shift). This was based on the typical starting time of the day shift (7 am) [16] and the three-shift work schedule divided equally into 8 hours per shift.

The time until fall detection was calculated by subtracting the time when the fall occurred from the time it was detected. The original data comprised six levels of fall severity: no hazard, recovery without sequelae after treatment or temporary damage or side effects, long-term damage or side effects, permanent damage or side effects, and death. This study adapted these into three categories: near-miss (no harm), adverse events (recovery without sequelae after treatment or temporary damage or side effects), and sentinel events (long-term damage or side effects, permanent injury and disability upon discharge, or death).

Data analysis

Descriptive statistics such as frequency and percentage were used for patients' gender and age, type and location of the healthcare facility, fall location, and time until fall detection. Based on the time until fall detection, participants were divided into three categories: those with falls detected immediately, those with falls detected within 60 minutes and those with falls detected after 60 or more minutes, expressed as frequency and percentage. In addition, means, standard deviations, medians, and ranges were calculated.

A chi-squared test was used to verify the difference of fall severity based on fall detection time. Another was conducted to determine the differences between fall detection times based on the characteristics of the patients and medical institutions. Logistic regression analysis was used to identify factors influencing whether a fall was immediately detected. Furthermore, the zero-inflated negative binomial regression (ZINBR) was used to identify the factors that influenced the time until fall detection. As the time until fall detection was most commonly 0 and the standard deviation was larger than the mean, the analysis was performed using ZINBR. The ZINBR can account for the over-dispersion of count data, handle issues related to the presence of many zero values, and improve the overall explanatory power by accounting for zero values [17].

Ethical consideration

As this study was based on secondary data analysis, the aims and methods were reviewed and approval was exempted by the Institutional Review Board of the first author's institution (Approval no. SMU-EX-2020-11-001).

Results General characteristics of participants with a fall experience

Table 1 presents the data from 3,470 patients who had experienced falls. Of these, 1,677 (48.3%) were women and 2,609 (75.2%) were aged above 60 years. Furthermore, the higher the age of the patient, the greater the frequency of falls. Falls predominantly occurred in general hospitals (45.7%), and the most common location was the patient room or the ICU (61.3%). In terms of nurses' shifts, 37.9%, 36.4%, and 25.8% of the falls occurred during the day, night, and evening shifts, respectively. The average time until fall detection was 22.06 (±114.11) minutes. A total of 2,933 (84.5%) falls were detected immediately. A total of 293 (8.4%) cases were detected between 1 and 60 minutes after the fall, while 244 (7.0%) were detected 60 or more minutes after the fall. Concerning patient safety, fall severity was observed in the following order: adverse events (1,968 cases, 56.7%), near-miss events (1,145 cases, 33.0%), and sentinel events (357 cases, 10.3%).

Differences in fall severity based on the time until fall detection

There was a significant difference in fall severity for each group based on the time of fall detection (χ^2 = 15.07, p = .005) (Figure 1). The group with a fall detection time of 60 or more minutes had significantly fewer cases (22.5%) of near-miss accidents than the group with immediate fall detection (34.0%) or the group with a detection time of less than 60 minutes (31.4%). Adverse events (66.4%) were significantly more frequent in the group with a detection time of 60 or more minutes after a fall than in the other two groups: 56.0% and 56.3% in the group with immediate fall detection and the group with a detection time of under 60 minutes, respectively.

Differences in the time until fall detection according to the patients' general characteristics

At the individual level, statistically significant differences in the time until fall detection were observed with reference to gender (χ^2 = 12.67, p = .013) and age (χ^2 = 23.54, p = .003) (Table 2). Falls were detected later for women than for men. Older patients' falls were not immediately detected (χ^2 = 23.54, p = .003).

At the hospital level, hospital type (χ^2 = 38.19, p 2 = 22.77, p = .007), and nurses' shifts (χ^2 = 195.48, p 2 = 38.19, p

2 = 22.77, *p* = .007). The number of patients whose falls were not detected immediately corresponded to nurses' shifts (χ^2 = 195.48, *p* **Factors influencing the time until fall detection**

Table 3 describes the factors influencing the time until fall detection using multiple logistic regression and the ZINBR analyses. Through logistic regression analysis, the following factors were found to be significant: age ≥80 years versus p = .020), general hospitals (OR = 1.40, *p* = .026) and hospitals (OR = 2.23, *p* p p

The ZINBR analysis was performed to account for diversiform data regarding the fall detection times. In the likelihood ratio test, the significance probability was smaller than .001, indicating that the data explained the model well. There were 537 patients whose falls were not detected immediately, and the count model predicted the risk factors that affected the delayed fall detection. Being women (*b* = 0.55, *p* = .007), aged 60–69 years compared to below 60 years (*b* = 0.72, *p* = .031), and the evening shift compared to the day shift (*b* = 1.51, *p* b = −0.48, *p* = .022) and hospitals (*b* = −1.07, *p* b = 0.82, *p* b = −1.08, *p* **Discussion**

It has been consistently reported that an early nurse intervention after a patient's fall can minimize the patient's disability [18]. However, to the best of our knowledge, no study has been conducted on fall detection times. This study offers new evidence by determining the fall detection time and elucidating its influencing factors, which have not been verified till date. This study's findings go beyond confirming the risk factors for falls as reported in the previous studies [19]. Furthermore, this study is important because it is the first to determine whether the time until fall detection affects the fall severity. Because there are few existing studies on fall detection time, we initially examined whether the time until fall detection influenced fall severity. As hypothesized, when falls were detected immediately, there were significantly fewer sentinel events (long-term damage or side effects, permanent damage or side effects, or death) or adverse effects (recovery without sequelae after treatment or temporary damage or side effects). Previous studies have suggested that delayed or absent nursing care, including observing a fall, was a risk factor in exacerbating patients' health status [20,21]. In this study, the fall detection time was identified as a direct variable causing patient injury; therefore, it was important to determine its related factors.

Multiple logistic regression was used to verify the differences between the group whose falls were detected immediately and those whose falls were not. There was a significant difference in gender and fall location variables compared to that of the ZINBR analysis method. Logistic regression analysis increases the likelihood of losing a substantial amount of information by condensing and examining data in a dichotomy for various frequencies [22]. At the individual level, factors affecting the time until fall detection using the ZINBR analysis included female gender and older age in patients whose falls were not detected immediately. However, there were no significant differences in gender or age among patients whose falls were detected immediately. These results are consistent with those reported in the previous studies. Specifically, the older the patient's age, the greater the lapse in self-management [23] and the greater the delay in reporting safety accidents [24]. These results were considered to have a more significant impact on the severity of the patient's condition [25]. Elderly patients tend to delay accident reporting because of communication problems, gait disorders, sensory dysfunction, and complex diseases, which are common in this age group [26]. Nevertheless, these results should be interpreted carefully as they did not show significant differences among elderly individuals (age ≥70 years). In many national-level fall assessment guidelines, the female gender has been considered a risk factor for falls because hormonal changes reduce bone mineral density [27,28]. Importantly, this study confirmed that old age and gender were risk factors not only for the occurrence of falls but also for delayed fall detection. These results indicate the need to establish a system that enables nurses to quickly detect falls and provide education on fall prevention for women and elderly individuals.

Regarding the type of healthcare facility, patients in tertiary hospitals were more likely to be in the group whose falls were detected immediately than those in other hospital types. In addition, the time taken to detect a fall was higher during the night shift than during other shifts. Tertiary hospitals have a lower RN-to-patient ratio than other hospital types [29], and night shifts have fewer nurse duty hours per patient per day than other shifts [30]. As no direct relationship was observed in the current study, these findings should be interpreted with caution. It is possible to infer, however, that a lack of nurses affects the time required to report patient safety accidents. Previous studies have found that nurse staffing levels are predictors of patient falls [31], and this study confirmed that the delayed

detection of patient safety accidents was related to an insufficient number of nurses. Therefore, to prevent any negative effects on patient health, nurse staffing levels must be considered [29,32]. Unlike previous studies, this study did not reveal any differences regarding hospital location and fall detection time. In the previous studies on location and patient safety, the frequency and severity were highest for accidents that occurred in the inpatient or treatment room [33]. Particularly, in a multi-patient room, patient risk events may occur more often because of inaccurate patient identification and noncompliance with drug administration regulations [33]. Based on these previous findings, the fact that the variables in this study considered all hospitalization rooms, without distinguishing between multi-patient and single-patient rooms, needs to be considered. Therefore, it is necessary to further explore the differences in patient accident detection times in accordance with the characteristics of the various hospital units.

A limitation of this study is that it included self-reported data of medical institutions, medical staffs, patients, and caregivers. Therefore, the results may have been underestimated, and there may be subjective interpretations and omissions depending on the informant. However, in South Korea, with the enforcement of the Patient Safety Act in 2016, the Ministry of Health and Welfare's Patient Safety Report and Learning System is being implemented. The reliability of the data can be guaranteed by confirming the contents of the reports and excluding false and duplicate reports from the KOPS. Notably, the number of accident reports has increased since the enforcement of the law.

The second limitation of this study is the lack of relevant variables in the secondary data. Data on other important individual characteristics (e.g., underlying disease, self-efficacy), fall-related characteristics (e.g., history of falls, nutritional status, drug use), and organizational-level variables (e.g., nurses' educational level, ward culture) that may affect the fall detection time were not examined and could not be reflected in the results. In addition, it is difficult to generalize the findings because each healthcare institution has a different level of patient safety reporting. However, because this study utilized secondary data, it accessed extensive data from several different-sized medical institutions. In terms of the nursing research, the use of the ZINBR, which can reliably be used to analyze data comprising large quantities of zero values within continuous data, was significant [22]. This study presents methods to analyze data that could be appropriate for future nursing studies on abuse, suicide attempts, and specific problem behaviors with similar characteristics.

Theoretically, it could be assumed that fall detection times affect patient safety and its influencing factors. However, it was difficult to interpret these results with confidence, because no previous study has identified this relationship and criteria for detection time that affect the fall patient's health. Future studies should build upon the present findings by examining the variables that influence the fall detection time and discovering cut-off point of the time. Furthermore, the importance of developing interventions to reduce fall detection time also needs to be recognized. In the future, this new evidence on delayed fall detection should be verified through replication studies using various data sources.

Conclusion

Timely interventions for fall patients have a positive effect on the hazards and trauma caused by the accident. The current study examined these differences, determined the factors affecting delayed fall detection, and provided essential evidence for improving policies governing the timely detection and treatment of fall accidents.

This study confirmed that, on an individual level, fall detection time may be higher in the case of female patients and those aged above 60 years. Regarding the hospital level, delayed fall detection is more likely to occur in general hospitals and hospitals than in tertiary hospitals and during night shifts. It is paramount for hospitals to improve the quality of conditions and nursing staff and for nurses to enhance patient education regarding fall prevention and management as well as regularly oversee safety instructions. This study recommended strategies to improve patient safety in healthcare facilities, such as continuous monitoring of fall risks and occurrences, education for nurses and patients, and improved nurse staffing.

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Conflict of interest

The authors declare that they have no competing interests.

Variables	Categories	n (%)/Mean ± SD
Gender	Men	1,668 (48.1)
Women	1,677 (48.3)	Unknown
125 (3.6)	Age (years)	<60
754 (21.7)	60≤ <70	650 (18.7)
70≤ <80	925 (26.7)	≥80
1,034 (29.8)	Unknown	107 (3.1)
Hospital type	Tertiary	555 (16.0)
General hospital	1,586 (45.7)	Hospital
467 (13.5)	Long-term–care hospital	862 (24.8)
Location where fall occurred	Patient room or ICU	2,126 (61.3)
Emergency room	62 (1.8)	Examination room, IR, TR, or Outpatient room
107 (3.1)	Other[a]	1,175 (33.9)
Nurses' shifts	Day (7 p.m.–3 p.m.)	1,314 (37.9)
Evening (3 p.m.–11 p.m.)	894 (25.8)	Night (11 p.m.–7 a.m.)
1,262 (36.4)	Time until fall detection (min)	0
2,933 (84.5)	0< <60	293 (8.4)
≥60	244 (7.0)	Mean ± SD
22.06 ± 114.11	Median (Min–Max)	0 (0–1,320)
Fall severity	Near-miss	1,145 (33.0)

Adverse event	1,968 (56.7)	Sentinel event

Variable		Category	Time until fall detection (n (%))			χ^2 (p value)
0min	1–60 min	≥60 min	Individual level	Gender	Men	1,411 (84.6)
137 (8.2)	120 (7.2)	12.67 (.013)	Women	1,403 (83.7)	151 (9.0)	123 (7.3)
Unknown	119 (95.2)	5 (4.0)	1 (0.8)	Age (years)	<60	657 (87.1)
54 (7.2)	43 (5.7)	23.54 (.003)	60≤ <70	544 (83.7)	47 (7.2)	59 (9.1)
70≤ <80	777 (84.0)	83 (9.0)	65 (7.0)	≥80	853 (82.5)	105 (10.2)
76 (7.4)	Unknown	102 (95.3)	4 (3.7)	1 (0.9)	Hospital level	Hospital type
Tertiary	489 (88.1)	35 (6.3)	31 (5.6)	38.19 (<.001)	General hospital	1,321 (83.3)
155 (9.8)	110 (6.9)	Hospital	366 (78.4)	43 (9.2)	58 (12.4)	Long-term–care hospital
757 (87.8)	60 (7.0)	45 (5.2)	Location of fall	Patient room and ICU	1,785 (84.0)	204 (9.6)
137 (6.4)	22.77 (.007)	Emergency room	60 (96.8)	0 (0.0)	2 (3.2)	Examination room, IR, TR, and outpatient room

97 (90.7)	3 (2.8)	7 (6.5)	Others	991 (84.3)	86 (7.3)	98 (8.3)
Nursing shifts	Day (7 p.m.–3 p.m.)	1,141 (86.8)	85 (6.5)	88 (6.7)	195.48 (<.001)	Evening (3 p.m.–11 p.m.)
825 (92.3)	0 (0.0)	69 (7.7)	Night (11 p.m.–7 a.m.)	967 (76.6)	208 (16.5)	87 (6.9)

Variables		Categories	Logistic regression (Time until fall detection: 0 or not)			Zero-inflated negative binomial regression				
Count model			Logit model			Odds ratio (95% CI)	p value	Coefficient	LL, UL	p value
Coefficient	LL, UL	p value	Individual level	Gender (vs. Men)	Women	1.07 (0.88, 1.31)	.487	0.55	0.15, 0.95	.007
0.07	−0.22, 0.36	.620	Unknown	0.36 (0.08, 1.57)	.174	−6.07	−9.50, −2.65	.001	−0.83	−5.00, 3.35

.698	Age (years) (vs. <60)	60≤ <70	1.30 (0.96, 1.77)	.091	0.72	0.07, 1.37	.031	−0.21	−0.64, 0.22	.332
70≤ <80	1.20 (0.90, 1.60)	.208	0.44	−0.17, 1.05	.158	−0.13	−0.53, 0.27	.511	≥80	1.41 (1.06, 1.88)
.020	0.23	−0.37, 0.82	.450	−0.39	−0.80, 0.02	.064	Unknown	0.77 (0.15, 3.91)	.748	5.87
1.86, 9.88	.004	2.37	−1.82, 6.56	.268	Hospital level	Hospital type (vs. tertiary)	General hospital	1.40 (1.04, 1.88)	.026	−0.22
−0.84, 0.41	.497	−0.48	−0.89, −0.07	.022	Hospital	2.23 (1.57, 3.17)	<.001	0.29	−0.45, 1.03	.439

−1.07	−1.63, −0.51	<.001	Long-term–care hospital	0.96 (0.68, 1.35)	.798	0.03	−0.69, 0.74	.943	0.05	−0.41, 0.51
.830	Location where the fall occurred (vs. patient room and ICU)	Emergency room	0.20 (0.05, 0.84)	.028	−2.33	−5.16, 0.50	.107	1.32	−0.52, 3.15	.159
Examination room, IR, TR &Outpatient room	0.72 (0.37, 1.42)	.343	1.06	−0.47, 2.58	.174	0.53	−0.29, 1.34	.205	Others	1.16 (0.94, 1.43)
.165	0.23	−0.24, 0.70	.341	−0.18	−0.48, 0.13	.252	Nurses' shifts (vs. day)	Evening (3 p.m.–11 p.m.)	0.58 (0.43, 0.78)	<.001

1.51	−0.79, 2.23	<.001	0.82	−0.45, 1.20	<.001	Night (11 p.m.–7 a.m.)	2.08 (1.67, 2.59)	<.001	−0.25	−0.72, 0.23

DETAILS

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Effects of the Anger Management Program for Nurses

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ABSTRACT (ENGLISH)

Purpose

The purpose of this study was to examine the effects of an anger management program on anger, job stress, psychological well-being, and heart rate variability in clinical nurses.

Methods

A quasi-experimental study was conducted using a nonequivalent control group, pre–post test design with repeated measures. The participants included 43 nurses assigned to the experimental and control groups. Anger, job stress, psychological well-being, and heart rate variability were evaluated before the intervention, immediately after the completion of the intervention, and four weeks after the end of the intervention. Chi-square test, t-test, Fisher’s exact test, and GEE (Generalized Estimating Equations) were used to analyze the data.

Results

There were significant differences in the level of anger, state anger, job stress, and psychological well-being between the two groups. The rate of change in the total power (TP) and the high-frequency band (HF) of the experimental group increased immediately after the intervention completion, but that of the control group decreased at the same time.

Conclusion

The above results demonstrate that an anger management program for nurses effectively attenuated anger and job stress, improved psychological well-being, and regulated heart rate variability.

FULL TEXT

Introduction

Anger refers to subjective feelings such as tension, irritation, and rage [1]. Anger is observed in unfair situations in which the needs or rights of individuals are ignored [2]. Anger can be divided into state anger, which can be experienced in momentary situations, and trait anger, which has temperamental tendencies [3]. Managing one's expression of anger can help prevent conflicts and improve organizational commitment [4]. However, uncontrolled expression and suppression of anger can cause an interpersonal problem and reducing job satisfaction and organizational performance [4,5].

Nurses experience anger when they are treated unfairly, face ethical dilemmas, and are blamed or not supported by coworkers or superiors [6]. However, Korean nurses often suppress or avoid anger [5], which can cause helplessness, frustration, stress, resentment, and even destructive behavior [7]. Moreover, unresolved anger can provoke anger in others [7] while reducing care behavior quality [8].

Hospital nurses experience high stress owing to a heavy workload and emotional demands [9]. Failure to control anger during work or ruminating about an incident can also lead to increased job stress [8]. Nurses who experience prolonged exposure to job stress can be damaged physical and psychological health and reduced job satisfaction [10]. On the other hand, controlling negative emotions such as anxiety and anger becomes more challenging for nurses in a stressful environment, and it is difficult for nurses to maintain psychological well-being [11]. Therefore, it is important to help nurses effectively manage their anger and job stress.

Psychological well-being refers to individuals' overall life satisfaction [12]. It helps individuals control their behavior and induces a sense of purpose in their lives [13]. Compared to other professions, nursing is associated with lower psychological well-being [14,15] owing to emotional exhaustion and suppression of negative emotions [15]. In the past, suppressing negative emotions has been regarded as a virtue; however, continuous suppression of anger and excessive stress can lead to an imbalance in the autonomic nervous system, which can negatively affect health [16,17]. Therefore, it is necessary to promote nurses' psychological well-being by helping them resolve their anger and reduce job stress in appropriate ways.

In the previous integrated literature review study, various stress programs have been proved to be effective in managing stress, depression, burnout, and increasing happiness among nurses [18]. The stress programs applied to nurses were mainly cognitive behavioral therapy, mindfulness therapy, and art therapy. In particular, cognitive behavioral therapy programs have been effective in the areas of occupational stress and mental health of nurses [18]. However, anger management should be approached differently from stress management.

To date, anger management programs have mostly been applied to groups expressing anger [19,20]. The anger management program mainly consists of understanding the causes and emotions of anger, rational thinking practice, and anger management skills training [19,20]. However, even groups that suppress anger need help in expressing and managing anger emotions in a desirable way. In previous studies [21,22], after applying the anger management program to nurses, an improvement has been noticed in psychological resilience and job satisfaction. This is because as nurses learn assertiveness and problem-solving skills, they become less frustrated with anger situations and improve their coping skills [21]. Therefore, it is necessary to apply a program that can reduce job stress and improve psychological well-being by acquiring positive anger expression and anger management skills for Korean nurses as well. In particular, this program focused on improving anger coping skills while on duty by combining education and practice.

Recently, anger was assessed using heart rate variability (HRV), which can be used to evaluate the activity and balance of the autonomic nervous system [23]. Consequently, we assessed the effects of an anger management program on nurses' anger, job stress, psychological well-being, and HRV.

Methods Design

This was a quasi-experiment study with nonequivalent control group pre test−post test design to understand the effects of anger management programs on nurses' anger, job stress, psychological well-being, and heart rate variability.

Participants

Nurses who worked at Hospital S and Hospital Y in Seoul, Republic of Korea, for more than one year and consented to participate were included in this study. Participants were recruited as those wishing to participate in this study. Nurses were assigned to either the experimental or control group based on marital status, length of career [4], and level of anger through matching. Participants were not informed the group to which they were assigned. Compensation (100$) was provided to the participants.

The number of required participants was analyzed by a repeated-measures analysis of variance (ANOVA), following the formula by Cohen (1988) [24], with a significance level of .05, power of .80, and median effect size of .3. Therefore, the number of required participants in each group was 20. Considering a dropout rate of 20%, 24 participants were assigned to each group. However, four participants from the experimental group withdrew for personal reasons, health issues (dropout rate of 17%). In the control group, one participant (dropout rate of 4%) was excluded for not participating in the post-test. Therefore, the data from 20 participants in the experimental group and 23 participants in the control were analyzed (Figure 1).

There were no significant group differences in any key variables (Table 1).

Measures Anger Levels

The levels of anger experienced during and outside of work were assessed using a visual analog scale [25]. Respondents indicated the level of anger from 0 (*no anger*) to 10 (*extreme anger*) in a straight line. Higher scores indicated increased anger.

Type

State anger and trait anger were evaluated using the STAXI-K IV, which was modified by Chon et al. [26] from the State–Trait Anger Expression Inventory (STAXI), developed by Spielberger [3]. This tool comprises 20 items (10 items each), which were measured on a Likert scale ranging from 1 (*not at all*) to 4 (*very much/always*). Higher scores indicated increased anger. Cronbach's α were .93 and .86 for state and trait anger, respectively, at the time of development; and .95 and .89, respectively, in this study.

Expression

Expression of anger was assessed using a tool developed by Chon [27,28]. This 20-item tool comprises four subdomains: suppression, expression, disguise, and anger control. Each question was evaluated with a four-point Likert scale ranging from 1 (*not at all*) to 4 (*almost always*), and expression of anger was evaluated using the mean score for each domain. In a preliminary survey of 20 nurses, Cronbach's α was .75; in this study, Cronbach's α was .70.

Job stress

Job stress was measured using the Korean version of the Expanded Nursing Stress Scale, developed by French et al. [29] and translated by Kim et al. [30], possessing good reliability and validity. This 48-item tool measures nine factors: death and dying, conflict with physicians, inadequate emotional preparation, problem relating to peers, problem relating to supervisors, heavy workload, uncertainty concerning treatment, patients and their families, and discrimination. Each item is rated on a scale of 0 (*never experienced*), 1 (*no stress at all*), to 4 (*always stressed*) points. Higher scores indicated higher job stress. Cronbach's α was .95 at the time of development and .91 in this study.

Psychological well-being

Psychological well-being was measured using the Korean version of the Psychological Wellbeing Scale, originally developed by Ryff [31] and modified by Kim et al. [13]. This 46-item tool measures six factors: self-acceptance, environmental mastery, positive relationship with others, autonomy, purpose in life, and personal growth with a five-point scale: 1 (*not at all*) to 5 (*very much*). Higher scores indicated greater psychological well-being. Cronbach's α was .91 at the time of development and .92 in this study.

Heart rate variability

HRV was measured using a pulse wavemeter (uBioClip v7, Biosense creative Ltd.; Seoul, South Korea) that analyzes pulse waves through an optical fiber sensor. Participants were asked to sit comfortably in a chair for about

10 minutes. Then, the machine was attached to the tip of a finger. For controlling factors that could affect the results, participants were asked to refrain from consuming alcohol and performing vigorous activities the day before. From three hours before the test, participants could not smoke, consume caffeine-containing beverages, or use drugs. We measured the following as per Kim and Min [16]: (1) Total power (TP), an index that reflects the overall regulatory ability of the autonomic nervous system, which decreases when stress is observed. (2) High frequency (HF), an index that reflects the activity of the parasympathetic nerve, decreases when stress, anxiety, and fear are experienced. (3) Low frequency (LF), mainly reflects the activity of the sympathetic nerve in long-term measurements, and it reflects both the activity of the parasympathetic and sympathetic nerve in short-term measurements. LF increases in situations with acute stress but decreases with chronic stress. (4) LF/HF, which reflects the overall balance of the autonomic nervous system. Values closer to 1.5 indicate better balance.

Anger management program Program development

The theoretical basis of this program was a cognitive behavior therapy model developed from Beck's cognitive theory [32]. Cognition, emotion, and behavior are closely related, and the behavior of anger occurs due to automatic thinking and distortion of cognition. Participants are able to manage anger by modifying their dysfunctional thoughts and actions that cause anger in a reasonable direction. In previous studies, it was proved that anger intervention based on cognitive behavior therapy was effective in adults [33].

A preliminary program was designed based on cognitive behavior therapy, an anger management program developed by Chon [27], literature review [33,34], focus-group interviews, and demand surveys. Focus-group interviews were conducted for 50 minutes with six nurses who had more than three years of work experience to assess their experiences and the need for an anger management program. The level of demand was evaluated in 13 nurses using nine items, which were evaluated on a 10-point scale. The demand survey examined the following contents: (1) the degree of anger at work; (2) negative emotions caused by anger; (3) the need for an anger management program; (4) the content and operation method of the anger management program; and (5) willingness to participate. Each session of the preliminary program was largely aimed at cognition, behavior change, and emotional regulation, following the cognitive behavior therapy approach.

The preliminary program was then reviewed by three nursing college professors, one psychiatrist, one clinician in emotional psychology, and three nurses with more than three years of clinical experience to obtain a content validity index ≥0.8. The final program was organized according to the four stages of the anger management model [34]. The model promotes participants' motivation and comprises a preparation stage to foster intimacy with the therapist, a strategic change stage to reduce anger by recognizing it and utilizing various management methods, an acceptance stage to accept and adapt to immutable situations, and a recurrence prevention stage to reinforce motivation and prevent the individual from returning to past patterns.

Consequently, the first session concerned an orientation and intimacy formation, followed by a second session about cognitive preparation for anger. Sessions three to six concerned the education for change and acceptance (physical, psychological, and social aspects). Last, sessions seven and eight focused on the prevention of recurrence. Each session comprised an introduction, activity, and conclusion. Anger-provoking cases used in the program were modified into situations and terms that were easy for nurses to understand, and anger management strategies that could be easily performed during work were selected.

In a meta-analysis on operating hours and sessions of the anger management group programs, it was recommended that more than nine sessions be performed for less than 60 minutes with less than seven participants [33]. However, based on a different study that decreased aggression in nurses after four two-hour sessions [21], advice from experts, and demand surveys that revealed that heavy workload limited nurses' ability to participate for more than two months, a small group (≤ eight) attended a one-hour session once a week for eight weeks (Table 2).

Application of the program

The first author obtained anger management instructor level two qualification by completing 16 hours of education at the Holistic Healing Academy and then further acquired level one qualification through eight weeks of anger management practice training. A manual was prepared to provide contents, methods, and time of the program in the

same manner, and the first author conducted each session of the program. Additionally, the education materials developed by Chon [27] were modified and distributed to the nurses in each session.

Considering that nurses worked on a three-shift schedule, the desired times and dates were individually adjusted for each session, and 3–8 groups of 3–8 participants were created. The program was conducted in a classroom of C University, where lectures and group discussions were given.

In the first session, HRV was measured after a preliminary survey, and a lecture on program orientation and the necessity of anger management was given.

In the second session (cognition change), we lectured on “self-understanding” and “the definition and formula of anger.” Nurses were informed that anger occurs when expectations do not match the given situation. After asking participants to consider their anger experiences as per the anger formula, they were asked to share their thoughts. Additionally, nurses were asked to record any experiences of anger during work in a diary for the next session.

The topic of the third session (cognition, behavior change) was “coping with anger by using attentional shift,” and a lecture on self-developed anger was given to explain that anger is a temporary emotion that can be self-controlled. Attentional coping steps such as leaving the scene, counting numbers, viewing family photos, etc., that is, the routine method was introduced. Subsequently, nurses were asked to judge whether their experience recorded in the diary was self-developed anger and share their preferred ways of attentional coping methods. Last, lavender, ylang-ylang, and chamomile German aroma oils, which are helpful in reducing anger, were introduced [35]. Necklaces were made using these oils. We recommended that nurses wear the necklace at work and manage anger by smelling the necklaces in anger-provoking situations. The task for next week (and the next three sessions) was to use one of the anger coping strategies and record the experience and effects in the diary.

In the fourth session (behavior change, emotional regulation), participants were given time to talk freely about the previous topic and share their experiences. They were informed that their anger management ability could be improved and were motivated to improve it. A lecture was given on “coping strategies that can be used in anger-provoking situations before, during, and after work.” Music and tea meditation were recommended to relax the mind before work. Time-out and video techniques were suggested for anger-provoking situations during work. Participants were also informed to not take their work-related stressors “home with them.” Then, participants practiced meditation techniques and shared their thoughts while drinking hot tea.

The theme of the fifth session (cognition change, emotional regulation) was “expanding one’s tolerance,” and strategies to accept uncontrollable situations, change controllable situations, and avoid inappropriate situations were introduced. Relevance of unreasonable expectation (i.e., its universally validity, whether it is useful after 10 years, whether communication is sufficient) was introduced.

In the sixth session (cognition, behavior change, and emotional regulation), participants were told that conflict or anger resulting from interpersonal relationships could be caused by overinterpretation of parts of the experience, and “expanding one’s tolerance” was re-explained. Participants practiced having conversations from the perspectives of others and ignoring the situations in which they cannot understand others. Then, so-called “anger candles” of various shapes were made using beeswax, and participants were encouraged to “burn the anger in their minds” with the candle.

In the seventh session (cognition, behavior change, and emotional regulation), a need for “transcendental thinking” was emphasized. Participants were told to think of a brighter future and see anger-provoking situations as opportunities for growth. Then, the group practiced assertive self-expression to express their feelings while being considerate of others. Participants were also asked to write their own anger management manual in addition to a letter of forgiveness or gratitude to themselves or others, which they could share with the group.

Last (behavior change, emotional regulation), participants were asked to write about the events or people that provoked the greatest anger in them on a note and post it on the board to relieve any feelings. After reflecting on past–present–future anger, participants shared their feelings and celebrated the end of the program. Participants’ HRV and satisfaction with the program were measured.

Data collection and process

This study was approved by the Institutional Review Board of a Catholic university (Approval no. MC17FESE0019). After obtaining permission to collect data from the nursing department, a recruitment advertisement related to the program was posted on the bullet board of the nursing department, and the program was advertised to nurses. The experimental group (Hospital S) underwent the eight-week program, while the control group (Hospital Y) did not receive any treatment.

Both the experimental group (June–October 2017) and control group (November 2017–February 2018) were asked to complete a questionnaire on anger, job stress, and psychological well-being—in addition to HRV—before the program, immediately after program completion, and four weeks after the end of the program. The collected data were assigned a unique number for each individual according to the guidelines of personal information processing.

Data analysis

Data were analyzed using SPSS WIN 23.0 (IBM, Armonk, NY, USA). Participants' general characteristics were presented as frequencies and percentages or means and standard deviations. Homogeneity of general characteristics and pretest dependent variables between the two groups were tested with t-tests, χ^2tests, and Fisher's exact tests.

Anger, job stress, and psychological well-being of the two groups measured before the program, immediately after program completion, and four weeks after program completion were analyzed with GEE (Generalized Estimating Equations). The rate of change in HRV was analyzed using t-tests.

Results Anger

In the experimental group, the level of anger during work decreased from 7.25 points before the program to 4.80 points immediately after program completion and four weeks after program completion. In contrast, in the control group, the difference in the level of anger during work was not significant from 7.17 to 6.78 and 6.30 measured before, immediately after, and four weeks after the program, respectively (p = .001). Moreover, the level of anger outside of work decreased from 4.10 points before the program to 3.65 points immediately after program completion and 2.25 point four weeks after program completion in the experimental group. Among controls, the level of anger outside of work changed from 3.44 to 3.09 and 3.96 measured before, immediately after, and four weeks after the program, respectively (p = .010; Table 3).

For the type of anger, the score for state anger in the experimental group was 16.60 before the intervention, which decreased to 10.90 and 12.20 immediately after program completion and four weeks after program completion, respectively. Among controls, the score for state anger changed from 14.35 to 16.09 and 13.52 (p = .002). Trait anger in the experimental group decreased from 20.80 points before the program to 18.95 and 18.50 points immediately after program completion and at four weeks after program completion, respectively. Among controls, the score increased from 21.91 to 20.83 and 20.96 (p = .449; Table 3).

There was no difference in the change in the expression of anger between before the program, immediately after program completion, and four weeks after program completion (p = .095~.537; Table 3).

Job stress

Job stress in the experimental group decreased from 3.47 points before the program to 3.23 points and 3.11 points immediately after program completion and four weeks after program completion, respectively. In contrast, job stress scores among controls were 3.57, 3.54, and 3.56 points before the program, immediately after program completion, and four weeks after program completion, respectively (p = .022; Table 3).

Psychological well-being

Psychological well-being in the experimental group increased from 3.43 points before the program to 3.57 and 3.61 points immediately after program completion and four weeks after program completion, respectively. Among controls, the scores barely changed: from 3.40 to 3.40 and 3.38, respectively (p = .016; Table 3).

HRV

Among the indicators of HRV, the rate of change in TP before and immediately after program completion was increased by 3.09% in the experimental group and decreased by 1.79% among controls (p = .028). The rate of change in TP immediately after the program and four weeks after program completion was decreased by 2.14% in

the experimental group and increased by 3.48% among controls (p = .012). The rate of change in HF before and immediately after program completion increased by 5.37% in the experimental group and decreased by 3.70% among controls (p = .010; Table 4).

Discussion

Compared to the control group, nurses experienced reduced anger during and outside of work after participating in the anger management program. This finding mirrors that of a previous study, which showed that an anger management program helped nurses control their negative emotions [22]. In the program, participants practiced understanding anger and modifying past thought patterns, and improve reasonable thinking skills. Modifying dysfunctional thought can help reduce anger [21, 36]. Therefore, even if the working environment does not change, the level of anger seemingly decreases. An anger intervention approach based on cognitive behavior therapy helped Korean nurses manage their anger and negative emotions.

The state anger among nurses in the experimental group decreased compared to the control group. With respect to trait anger with temperamental tendencies, while the experimental group showed a decreasing trend, an increasing trend was noticed in the control group; however, there was no significant interaction. In the program, nurses learned an integrated (physical, social, and psychological) anger management method aimed at facilitating immediate responses to anger situations. The nurses continued to practice and self-reflect through an anger diary in each session. Through this, it is estimated that the state anger decreased as the ability to cope with momentary anger improved. However, the trait anger with temperamental tendencies is difficult to change with increased age. Since it is more effective to apply anger management programs to adolescents [33] and college students [37], it is necessary to develop and apply a program to help nursing students manage anger.

In this study, a tool that included the concept of anger disguise was used to reflect the anger expression patterns of Korean nurses. Korean nurses disguised their anger by sulking or cursing inwardly. Korean nurses tend to suppress their emotions or express their anger passively, as they fear expressing anger will worsen the situation [38]. However, it causes the provoker's wrong behavior to be overlooked, resulting in repetitive anger situations. This not only makes the situation worse but also causes stress to the nurse; therefore, it is important to actively help nurses manage anger [38].

In this study, there was no significant Group × Time interaction concerning the expression of anger. Although direct comparisons are difficult, as different measurement tools were used, this finding contrasts those from other studies [36] where expression of anger changed positively after an anger management program was implemented with college students. The sessions and contents of programs in previous studies [36] were similar to those of our study. However, participants' experiences and environments differed. From this study, nurses may have been more exposed to anger situations while on duty. The method of coping with anger may has already been fixed. Therefore, we posited that because college students' behavioral habits related to anger were less fixed [33], they responded in a more flexible way. Therefore education for anger management should be more emphasized in the curriculum of nursing students. In addition, when applying an anger management program to nurses, it is necessary to evaluate changes in the expression of anger by implementing an in-depth approach through individual counseling or customized anger management programs according to individuals' expressions of anger.

Job stress decreased among the experimental group; however, no significant change was observed among the controls. This was similar to Lee et al.'s (2016) findings, which showed that anger and stress decreased after programs that implemented a cognitive-behavioral approach and provided relaxation therapy to emotional labor workers [39]. Another study that applied cognitive emotional behavior therapy with nurses observed similar findings [40]. Distorted and repetitive anger-provoking situations at work lead to increased job stress [8]. Moreover, conflicts between patients, guardians, and healthcare professionals are a major cause of job stress in nurses [41]. Instead of suppressing feelings of anger, nurses learned desirable communication skills and were trained in interpersonal skills. It is thought that job stress decreases as the ability to flexibly respond to anger and conflict and problem-based coping skills improve.

Psychological well-being increased in those in the experimental group; however, no change was observed among

the controls. In previous studies, positive internal resources such as gratitude and social support could increase psychological well-being [14,42]. As a result, in the current program, participants were taught tolerance to better understand anger-provoking situations and others' reactions. Moreover, writing a letter of gratitude and embracing forgiveness may have promoted feelings of social support through emotional exchanges and encouragement with colleagues, thereby increasing psychological well-being.

HRV was measured as an objective indicator of psychological state. In anger-provoking and stressful situations, TP and HF decrease while LF increases [16]. However, in situations with chronic stress, HF and LF decreased [43]. Additionally, in short-term measurements, the reliability of LF was low [16]. Therefore, the rate of change of TP and HF was confirmed in this study. The rate of change in HRV was analyzed based on the advice of a psychiatrist. The rates of change in TP and HF immediately after the program in the experimental group increased, while they decreased among controls, suggesting that the program was effective in helping nurses manage anger and stress. This result was similar to the finding of another study [44], in which stress and anger decreased while HF increased after a four-week distress management program was conducted with patients with cancer. However, various factors such as lifestyle and environments affect HRV as well [16,45]. Therefore, it is possible that the aroma necklaces and other factors could have affected the nurses in the experimental group. We recommend studies that control for variables that can affect HRV to confirm the effects of the anger management program.

Participants in the experimental group reported that it was possible to talk more comfortably and empathize with others because the group was small. Moreover, they reported feeling social support by being able to discuss the anger and stress experienced at work. Anger negatively affects the quality of care and job satisfaction [4,8]. Therefore, rather than dismissing these as individual problems, measures at the hospital or departmental level, such as forming a dedicated counseling team to support freedom of expression and helping nurses control their emotions, are necessary. Moreover, as regular follow-up training is essential for anger management education [33], supportive policies to monitor and conduct anger management programs regularly would be important. Additionally, participants suggested that it would be desirable if the sessions are conducted online, especially considering that nurses worked on a three-shift schedule. Thus, in the future, it will be necessary to operate an anger management program with online access.

The anger management program was effective in reducing nurses' anger and job stress and improving their psychological well-being. Nonetheless, this study had some limitations. The expression of anger was defined as yelling or direct aggression toward others; passive aggression was not included. Future research should confirm the effectiveness of the anger management program by developing a new tool that includes passive aggression. Also, the sample size was small, and individual lifestyle factors were not controlled. In addition, our follow-up period was brief. Despite these setbacks, we implemented a novel anger management program for nurses in South Korea, and anger was assessed using various concepts: expression, suppression, control, and disguise. Moreover, the effects of the program were assessed using HRV—an objective indicator. We propose that future studies develop a tool that can assess anger experienced by nurses in clinical practice and further modify the anger management program to assess its long-term effects.

Conclusion

The novel anger management program effectively reduced anger and job stress and improved psychological well-being among clinical nurses in South Korea. Additionally, the program also showed stable effects concerning HRV. Participants reported that the program was helpful in maintaining emotional stability and harmonious relationships with others through effective management strategies to control anger and react in healthy cognitive ways in anger-provoking situations. We suggest that future researchers assess whether anger management programs improve nurses' organizational commitment and care quality and prevent burnout. Additionally, we suggest an intervention study combining the anger management program with meditation and exercise therapies. Furthermore, education for anger management should be more emphasized in the curriculum of nursing students.

Conflict of interest

No potential or any existing conflict of interest relevant to this article was reported.

Characteristics	Exp (n = 20)	Cont (n = 23)	χ^2/t	p
n (%)/Mean ± SD	n (%)/Mean ± SD	Age	32.10 ± 5.73	32.19 ± 5.97
0.45	.652	Religion		
Yes	14 (70.0)	10 (43.5)	3.05	.081
No	6 (30.0)	13 (56.5)		
Marital status				
Single	12 (60.0)	11 (47.8)	0.63	.425
Married	8 (40.0)	12 (52.2)		
Education				
<Bachelor	7 (35.0)	14 (60.9)	2.87	.129
≥Master	13 (65.0)	9 (39.1)		
Length of career				
1~4	4 (20.0)	4 (17.4)		>.999[a]
5~9	6 (30.0)	8 (34.8)		
≥10	10 (50.0)	11 (47.8)		
Duty type				
Day duty	7 (35.0)	10 (43.5)	0.32	.756
Shift duty	13 (65.0)	13 (56.5)		
Department				
General ward	14 (70.0)	10 (43.5)		.127[a]
Outpatient department	3 (15.0)	10 (43.5)		

Nurse specialist	3 (15.0)	3 (13.0)		
Anger				
Level of anger				
During of work	7.25 ± 2.02	7.17 ± 1.67	−0.14	.893
Outside of work	4.10 ± 3.16	3.43 ± 2.24	−0.80	.430
Type of anger				
State anger	16.85 ± 8.52	14.35 ± 5.02	−1.14	.262
Trait anger	21.15 ± 5.01	21.91 ± 6.18	0.44	.662
Expression of anger				
Anger-in	2.19 ± 0.63	2.22 ± 0.47	0.16	.872
Anger-out	1.68 ± 0.49	1.80 ± 0.51	0.78	.437
Anger-disguise	1.89 ± 0.57	1.83 ± 0.57	−0.37	.715
Anger-control	2.33 ± 0.45	2.23 ± 0.56	−0.67	.508
Job stress	3.47 ± 0.37	3.57 ± 0.44	0.82	.415
Psychological well-being	3.43 ± 0.44	3.40 ± 0.37	−0.25	.803
Heart rate variability (normal range)				
Total power (7.4~9.3 ms^2)	8.51 ± 0.92	8.49 ± 0.51	−0.08	.938
HF (4.2~7.4 ms^2)	6.35 ± 0.83	6.65 ± 0.80	1.22	.231
LF (6.1~8.1 ms^2)	7.00 ± 1.16	7.07 ± 0.66	0.24	.812
LF/HF (0.4~2.2)	1.09 ± 0.13	1.08 ± 0.15	−0.06	.955

Session	Theme	Introduction	mins	Learning &Activities	mins	Closing	mins
1	•Orientation•Introduction	•Greeting	10	•Pre-test•Introduce program	2010	•Share the anger experience•Homework	155
2	Cognition change•Self-understanding•Understanding of anger	•Review•Check-up homework	10	•Want profile test•Definition of anger•Formula of anger	101010	•Discussion•Homework: anger diary	155
3	Cognition and Behavior change•Anger management I (The coping with anger)	•Review•Check-up homework	10	•Psychological aspect: transposition methods•Aroma necklace	1515	•Discussion•Homework: anger diary	155
4	Behavior change &Emotional regulation•Anger management I (The coping with anger)	•Review•Check-up homework	10	•Physical aspect: the method of coping with anger•Anger management at work•Tea meditation	101010	•Discussion•Homework: anger diary, cognitive distortion	1010
5	Cognition change &Emotional regulation•Anger management II (Permissible range)	•Review•Check-up homework	10	•Psychological aspect-Cognitive distortion, Understanding others-Principle of AAA(accept, avoid, alter)	30	•Discussion•Homework: anger diary	155
6	Cognition and Behavior change &Emotional regulation•Anger management II (Permissible range)	•Review•Check-up homework	10	•Social aspect-Personal relations, Anger and stress•Anger candle	1515	•Discussion•Homework: anger diary	155
7	Cognition and Behavior change &Emotional regulation•Practice	•Review•Check-up homework	10	•Transcendental aspect: self-growth•Write a letter forgiveness &thank•Anger plan	101010	•Discussion•Homework: anger diary	155

8	Behavior change &Emotional regulation•Review	•Review• Check-up homework	10	•Anger tree &Portfolio•Sharing feeling each other	2010	•Completion ceremony•Post-test	515
9	•Continuous action			•Follow-up		•4 weeks later-test	

Variables		Pre test	Post-test I	Post-test II	Source	χ^2
p	M ±SE	M ±SE	M ±SE	Level of anger		
During of work						
Exp		7.25 ±0.44	4.80 ±0.47	4.80 ±0.40	Group Time Group*Time	6.75 35.98 15.11
.009 <.001 .001*	Cont		7.17 ±0.34	6.78 ±0.43	6.30 ±0.38	Outside of work
Exp		4.10 ±0.61	3.65 ±0.60	2.25 ±0.57	Group Time Group*Time	0.17 2.13 9.15
.683 .344 .010*	Cont		3.44 ±0.57	3.09 ±0.56	3.96 ±0.53	Types of anger
State anger						
Exp		16.60 ±1.90	10.90 ±0.34	12.20 ±1.00	Group Time Group*Time	2.49 5.04 12.37
.114 .080 .002*	Cont		14.35 ±1.02	16.09 ±1.59	13.52 ±0.82	Trait anger
			Exp		20.80 ±1.10	18.95 ±0.91

18.50 ±0.92	Group Time Group*Time	1.68 10.75 1.60	.194 .005 .449	Cont	21.91 ±1.26
20.83 ±1.23	20.96 ±1.71	Expression of anger			
Anger-in					
Exp	2.22 ±0.14		2.22 ±0.10	2.16 ±0.13	Group Time Group*Time 0.03 0.12 1.52
.855 .944 .469	Cont	2.22 ±0.10		2.18 ±0.11	2.28 ±0.10 Anger-out
Exp	1.67 ±0.11		1.58 ±0.11	1.49 ±0.11	Group Time Group*Time 1.98 6.55 1.24
.159 .038 .537	Cont	1.80 ±0.10		1.83 ±0.12	1.69 ±0.10 Anger-disguise
Exp	1.92 ±0.12		1.81 ±0.09	1.73 ±0.13	Group Time Group*Time 0.10 5.13 1.27
.758 .077 .530	Cont	1.83 ±0.12		1.73 ±0.11	1.77 ±0.12 Anger-control
Exp		2.35 ±0.10	2.54 ±0.12	2.44 ±0.10	Group Time Group*Time 1.82 3.31 4.70
.177 .191 .095	Cont		2.23 ±0.11	2.22 ±0.10	2.36 ±0.09 Job stress
Exp		3.47 ±0.09	3.23 ±0.10	3.11 ±0.11	Group Time Group*Time 6.84 8.35 7.63

.009 .015 .022*	Cont	3.57 ±0.86	3.54 ±0.92	3.56 ±0.10	Psychological well–being
Exp	3.43 ±0.10	3.57 ±0.08	3.61 ±0.09	Group Time Group*Time	1.81 5.14 8.28

Variables	Between pre test and post-test I percentage change	t (p)	Between Post-test I and post-test II percentage change	t (p)
Heart rate variability (normal range)				
Total power (7.4~9.3 ms^2)				
Exp	3.09 ±7.89	−2.28 (.028)*	−2.14 ±6.60	2.64 (.012) *
Cont	−1.79 ±6.16	3.48 ±7.28	High-frequency band (4.2~7.4 ms^2)	
Exp	5.37 ±9.94	−2.69 (.010)*	−1.86 ±9.55	1.28 (.209)
Cont	−3.70 ±11.87	2.28 ±11.39	Low-frequency band (6.1~8.1 ms^2)	
Exp	7.82 ±13.96	−2.16 (.037)*	−2.62 ±10.84	2.42 (.020) *
Cont	−0.57 ±11.47	5.23 ±10.41	Low-frequency band/High-frequency band (0.4~2.2)	
Exp	4.77 ±12.67	−0.35 (.725)	0.07 ±9.02	1.24 (.224)

DETAILS

Subject: Occupational stress; Anger management; Job satisfaction; Stress; Behavior modification; Nervous system; Likert scale; Emotions; Workloads; Managerial skills; Nurses; Cognition &reasoning; Variance analysis; Heart rate

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Development and Validation of an Instrument for Measuring Parenting Stress among Clinical Nurses

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ABSTRACT (ENGLISH)

Purpose

Clinical nurses who are mothers of preschool-aged children experience extreme parenting stress linked to their hospital work environment and shift work, differing from that generally experienced by mothers. This study aimed to develop and validate a parenting stress scale that considers the clinical nurses' form of work and its characteristics.

Methods

The scale items were initially derived from in-depth interviews and a literature review and were revised and modified based on the results of content validity testing by experts. The developed instrument was evaluated using data from 157 clinical nurses in South Korea who were mothers of preschool-aged children.

Results

In the instrument validation stage, 19 items categorized in four factors (psychological burden, physical and mental fatigue, work shift, and work environment) were derived from construct validity, and the cumulative explanatory power was 56.6%. Furthermore, the convergent and discriminant validity and external construct were confirmed. Cronbach's α of the final instrument was .86 (range: .81–.86). The validity and reliability of the newly developed parenting stress scale for clinical nurses were established in this study; it uses a 4-point Likert scale. A higher mean score by factor indicates a higher level of parenting stress experienced by clinical nurses.

Conclusion

This instrument would be beneficial to measure the level of parenting stress among nurses who work in hospitals and evaluate factors related to their parenting stress to devise effective interventions.

FULL TEXT

Introduction

According to the Survey of Inactive Nurses by the Korean Nurses Association, women's life events such as marriage, pregnancy, childbirth, and childrearing are important factors contributing to career disruption among nurses [1]. In a study analyzing the relationship between gender role values, the labor market structure, and the birth rate in 24 countries using Organization for Economic Cooperation and Development and World Values Survey data, Brinton and Lee [2] classified South Korea as a country that accepts women's economic participation but still holds traditional gender role values. It is in line with a social atmosphere that attributes more parenting responsibility to women than men. A total of 77.2% of Korean women and 35.6% of Japanese women agreed with the item "Having children limits parents' employment and career opportunities" in a questionnaire survey conducted by the Korea Women's Development Institute with men and women living in Seoul and Tokyo [3]. Women in Korea struggle to maintain work–family balance when they have children, and many eventually quit their jobs.

Among women's various occupations, nursing is particularly difficult to combine with rearing children because of

family-unfriendly work hours, such as shift work and weekend shifts, along with excessive workload [4]. Thus, married clinical nurses with children require a higher work–home balance than nurses without children or unmarried nurses; carrying on with work becomes challenging, and they may consider resigning [5, 6].

In research related to parenting by clinical nurses, clinical nurses reported feeling “guilt for not fulfilling their duties as mothers”; particularly, they felt heartbroken for not having enough time to care for their children and felt that all the problems with their children were their fault [1]. Another study found that nurses have difficulties in terms of spending time with their children, as they cannot routinely engage in activities with them because of irregular daily patterns of shift work and have trouble focusing on their children as they feel pressured to sleep early to work an early morning shift the next day [7]. There are several other work-related reasons for high parenting stress among nurses, including being physically and mentally tired, which leads them to misdirect their stress and frustration onto their children, only to regret doing so afterward, as well as the inability to be notified during work or leave work early when their child is sick [7]. Particularly, nurses who work an 8-hour rotating shift while rearing preschool-aged children struggle with dropping off and picking up their children at daycare because of their work schedule, which requires early morning or late-night work [5]. In addition, preschool age is a critical period for growth and development, and mothers’ parenting stress is more critical in this period than at other times [8]. This is because this is a critical period for building mother–child attachment, and high perceived mental and psychological parenting stress in working mothers who fulfill multiple roles has adverse effects on their parenting [9], with parenting stress increasing turnover [10].

As discussed previously, parenting stress experienced by clinical nurses is associated with shift work, weekend shifts, low flexibility in the work schedule, and caregiving work–related characteristics. The Parenting Stress Scale (PSS; 1997) by Kim and Kang [11], generally used to assess parenting stress in nurses in Korea, was developed to measure general parenting stress based on daily stress from childrearing, the burden of parental roles, and guilt for having children reared by others. Furthermore, the Parenting Stress Index Short Form by Abidin [12] also measures general parenting stress based on the parent, parent–child relationship, and child domains. However, these instruments are limited when measuring parenting stress experienced by nurses, which differs from the general parenting stress experienced by mothers. Accordingly, this study aimed to develop and validate an instrument to specifically assess parenting stress among clinical nurses who are mothers of preschool-aged children.

Methods Design

This study developed and validated an instrument to assess parenting stress in clinical nurses who rear preschool-aged children, with reference to the instrument development process suggested by DeVellis [13]. Therefore, this study proceeded in two stages. The first stage was instrument development, during which the preliminary items—based on a literature review and focus group interviews—were developed. The preliminary items were then validated by experts, and a pilot test was conducted. The second stage was instrument validation. Item analysis and validity and reliability testing were performed to finalize the instrument.

Ethics

After obtaining approval from the institutional review board at a university hospital, the author's affiliation (Approval no. SMC 2019-10-089-001), nurses who agreed to participate were informed of the purpose, method, data collection, and duration of the study, voluntary study participation and withdrawal, lack of disadvantages from study withdrawal, and confidentiality of collected data. The questionnaire was distributed to those who voluntarily consented to participate. All participants provided informed consent for the research, and their anonymity was preserved. Permission was received from the copyright holder to use and translate copyrighted instruments/software used in the research.

Step 1: Instrument development Derivation of preliminary items

One-to-one interviews were conducted with five nurses who reared preschool-aged children to examine the characteristics of parenting stress among clinical nurses. After building rapport, the interviews with clinical nurses lasted at least an hour, and a comfortable environment was fostered to help the nurses talk about the challenges they encountered in raising their children while working at a hospital. Then, the properties of parenting stress derived from the interviews were integrated with those found through a literature review [4, 14–16]. Clinical nurses' parenting

stress was broadly divided into personal and environmental dimensions. The personal dimension included “psychological burden,” “anxiety and guilt,” and “physical and mental fatigue” factors, whereas the environmental dimension included “work shift,” “work environment,” and “awareness of others’ judgment” factors. The preliminary items for the PSS for clinical nurses who raise preschool-aged children were developed based on these results, with a total of 41 items being initially derived (Figure 1).

Determination of measurement scope

This study used an even-numbered scale to remove central response tendency because it has been shown that if a neutral response is available, participants who are reluctant to choose extreme responses or to respond at all may choose it, which can restrict the variance of measurements [17]. Thus, a 4-point Likert scale was used: 1 (strongly disagree), 2 (disagree), 3 (agree), and 4 (strongly agree).

Content validity testing

The content validity of the instrument was assessed by a panel of six experts comprising two psychiatric nursing professors, two pediatric nursing professors, and two female health nursing professors. It was assessed using a 4-point scale ranging from 1 (not relevant) to 4 (highly relevant), and experts were asked to present any opinions about items that required revision as well as about the items overall. The item content validity index (I-CVI) and scale content validity index (S-CVI) were calculated for the preliminary items. The S-CVI used the S-CVI/average (S-CVI/Ave) and S-CVI/universal agreement (S-CVI/UA). Two items in the “psychological burden” factor and two items in the “awareness of others' judgment” factor with an I-CVI below .78 were deleted [18]. As per experts' comments, the meanings of eight items were clarified, one item was added to the “work environment” factor, and one item was added to the “awareness of others’ judgment” factor. In the second content validity test, all items had an I-CVI of .83 or higher, the S-CVI/Ave was .99, and S-CVI/UA was .95. Consequently, 39 items were included in the preliminary tool.

Pilot test

To examine the applicability of the preliminary tool, a pilot test was conducted with seven clinical nurses who raised preschool-aged children to assess the time required to complete the survey, item comprehension, and item length. It took an average of 9 minutes to complete the survey, and none of the items were considered difficult to understand or too long.

Step 2: Instrument validation Participants

Nurses who worked in general hospitals in two regions and were mothers of preschool-aged children were enrolled to test the validity and reliability of the instrument. The inclusion criteria were (1) female clinical nurses who work in a hospital, (2) parent of a preschool-aged child, and (3) informed consent to participate in the study. The exclusion criteria were: (1) parent of twins, (2) nurses not involved in direct patient care, and (3) single mothers. In consideration of the minimum sample size of 150 for factor analysis and a 10% withdrawal rate, a total of 165 questionnaires were distributed, and 161 were retrieved. After excluding questionnaires unsuitable for analysis because of missing responses, 157 participants were included in the final sample. This satisfied the minimum required sample size of 150 for factor analysis [19,20].

Data collection

First, after explaining the purpose and procedure of this study to the relevant institutions, data were collected between November 1 and 30, 2019, from four general hospitals in two regions of South Korea that approved the collection. Recruitment announcements were posted in the nurse education rooms in the four general hospitals. Second, participants who wished to participate in this study were checked for the inclusion criteria. The purpose, procedure, and method of the study were explained, and sufficient understanding was confirmed.

If there was a willingness to participate voluntarily, a questionnaire was conducted after obtaining written consent.

Instruments

The questionnaire consisted of nine items for demographic characteristics, 39 items developed in this study, and 11 items of the PSS developed by Kim and Kang [11] and modified by the Korea Institute of Child Care and Education (KICCE; 2015) to test the criterion validity. Cronbach’s α for the KICCE version of the PSS was .82 in this study.

Data analyses

The data collected to test the reliability and validity of the instrument were analyzed using SPSS 21.0 (IBM. Corp., Armonk, NY, USA). Participants' demographics were summarized using descriptive statistics and frequency analysis. To evaluate construct validity, first, item analysis was performed using correlation coefficients, and second, exploratory factor analysis (EFA) was conducted using maximum likelihood estimation and oblique rotation. Oblique rotation—which is more robust than orthogonal rotation and promax rotation and is the most common rotation method—was used [21]. Kappa, which refers to the level of permitted correlation between factors, was set to 4 [22]. Third, the convergent and discriminant validity of the final instrument was tested using the multitrait-multimethod matrix, which examines the correlations of each item, both with their respective factors and the remaining factors. Fourth, criterion validity was tested based on the correlation between the finalized instrument and the KICCE version of the PSS. Finally, the reliability of each factor and the overall instrument were assessed using Cronbach's α.

Results Sample characteristics

The mean age of the participants was 36.19 ± 3.36 years, and the mean length of their clinical career was 13.64 ± 3.14 years. Regarding job positions, 44.0% were staff nurses, 48.4% were charge nurses, and 7.6% were head nurses. The most common type of work shift was the 8-hour rotating shift (53.5%), followed by full-time (28.0%), mixed (9.6%), and 12-hour rotating shift (8.9%). In terms of education, 5.1% had an associate degree, 69.4% had a bachelor's degree, and 25.5% had a master's degree or higher. The majority of the participants (73.2%) had one preschool-aged child, whereas 24.2% had two, and 2.6% had three or more. Most of the participants (89.8%) lived with their children, and 94.9% used a childcare facility. While 64.3% were dissatisfied with their spousal support, 26.1% were satisfied (Table 1).

Construct validity: item analysis

First, the skewness and kurtosis of each item were examined to determine the normality of the collected data. The skewness values ranged from −1.09 to 0.40, and kurtosis values ranged from −1.04 to 1.35. As the absolute value of skewness and kurtosis did not exceed 3 and 10, respectively, the assumption of normality was met [23].

Next, to examine the contribution of each item, the correlations of each of the 39 items with the overall items were examined. Items 29 and 35 had a correlation coefficient below .30 and were thus deleted for having low discriminatory power [24]; the correlation coefficients for the remaining 37 items with the overall items ranged from .30 to .70 (Table 2).

Construct validity: EFA

To determine whether the 37 items selected through item analysis were suitable for EFA, the Kaiser–Meyer–Olkin statistic was calculated, and Bartlett's test of sphericity was performed. The Kaiser–Meyer–Olkin value was .66, and χ^2 in the test of sphericity was 4011.90 (df = 666, p 25].

In the first round of EFA, factors with an eigenvalue of 1 or higher were extracted, and to determine the number of factors, the 4- and 10-factor models on the scree plot were considered. Although at least three items are required for a single factor [26,27], the 10-factor model contained factors that only consisted of two items; thus, 10 factors were considered excessive. Thus, in the second round of EFA, the number of factors was set to four. Items were extracted based on the following criteria: communality of .3 or higher, factor loading of .30 or higher, and a difference of factor loading between factors of .20 or higher [24]; the reference values were taken from the rotated pattern matrix. Twelve items were considered for deletion in the second round, three items were considered for deletion in the third round, and three were considered for deletion items in the fourth round, as they did not meet the criteria; they were finally deleted based on the judgment that they lacked distinctive characteristics. In the fifth round of EFA, 19 items in four factors were considered as final. Factor 1 had an eigenvalue of 3.28, explanatory power of 17.3%, and the factor loadings of the six items included were .63 or higher. Factor 2 had an eigenvalue of 2.61, explanatory power of 13.7%, and the factor loadings of the five items included were .62 or higher. Factor 3 had an eigenvalue of 2.95, explanatory power of 15.6%, and the factor loadings of the five items included were .60 or higher. Factor 4 had an eigenvalue of 1.90, explanatory power of 10.0%, and the factor loadings of the three items included were .66 or higher. The cumulative explanatory power of the four factors was 56.6% (Tables 2 and 3).

Convergent and discriminant validity

The multitrait-multimethod matrix showed that the correlation coefficients of the 19 items with their respective factors all exceeded .40, with a range of .64–.87, showing a scaling success rate of 100% for convergent validity. Furthermore, the correlation coefficients of each item with other factors ranged from -.06 to .46. As each item correlated to a lesser extent with other factors than their respective factors, discriminant validity was established [28] (Table 3).

External construct validity

The Pearson correlation coefficient for the relationship between the PSS for clinical nurses developed in this study and the KICCE version of the PSS was significant at .36 (*p* Table 4).

Reliability

The reliability of the instrument was evaluated using the Cronbach's α coefficient, which measures internal consistency. Cronbach's α for the final instrument was .86. Internal consistency was thus established with a value of Cronbach's α of .86 for Factor 1, .82 for Factor 2, .84 for Factor 3, and .81 for Factor 4 [29] (Table 3).

Finalization of the instrument

The PSS for clinical nurses finally contained 19 items categorized in four factors: six items for Factor 1 "psychological burden," five items for Factor 2 "physical and mental fatigue," five items for Factor 3 "work shift," and three items for Factor 4 "work environment." Each item is rated on a 4-point Likert scale: 1 (strongly disagree), 2 (disagree), 3 (agree), and 4 (strongly agree). As the instrument has different number of items for each factor, the mean score for each factor is calculated to allocate scores evenly across factors. The total score ranges from 4 to 16, with a higher score indicating a higher level of parenting stress among clinical nurses (Appendix A).

Discussion

This is the first study to develop and validate an instrument for assessing parenting stress in nurses raising preschool-aged children. The following four factors in two dimensions were extracted through validity testing: Factor 1 "psychological burden" and Factor 2 "physical fatigue" in the personal dimension and Factor 3 "work shift" and Factor 4 "work environment" in environmental. Some items in the preliminary factors "anxiety and guilt" and "awareness of others' judgment" were deleted. The percentage of variance explained was similar across factors: 17.3% by Factor 1, 13.7% by Factor 2, 15.6% by Factor 3, and 10.0% by Factor 4.

Factor 1, "psychological burden," represents the burden of raising a child while working as a clinical nurse. Most instruments used in previous studies also include items about psychological burden in their measurement of parenting stress. In the one developed by Kim and Kang [11], daily stress, burden and distress of parenting role, and guilt for relying on other care providers all fall under the psychological burden; the instrument developed by Abidin [12] also includes psychological burden using a domain named "parents' pain." In the previous study of clinical nurses who are mothers of preschool-aged children, daily stress and psychological burdens accounted for a high proportion of parenting stress [9]. According to the 2019 Survey About Parenting Policies for Establishing a Happy Parenting Culture conducted by the KICCE [30], the mean distribution of parenting roles for mothers and fathers was 7.0 and 3.0 out of 10, respectively, which shows that mothers still have a heavy psychological burden from parenting in Korean society.

Factor 2, "physical and mental fatigue," consists of items measuring physical fatigue caused by parenting and the extent to which the burden of potential emergencies and burnout caused by stress with patients and coworkers may lead to parenting stress. It is in line with the report that emotional and physical exhaustion, apathy, helplessness, and desensitization to patients and families are central constructs related to compassion fatigue in nurses [31]. Nursing requires intense concentration to care for patients, long working hours, and inevitable emergencies and irregularity, which ultimately generates work–family conflicts [32]. In addition, female nurses have higher work–family conflicts than male nurses [33,34] and differ in psychological health conditions [34]. The factor of physical and mental fatigue as parenting stress of clinical nurses who are mothers of preschool-aged children can be considered reasonable.

Factor 3, "work shift," encompasses nurses' concerns regarding their inability to take care of children because of

rotating shift work and weekend shifts and having a harmful influence on their children as a result of an irregular living environment. It showed similar results to a previous study in which married rotating shift nurses had higher life–work conflict than nonshift nurses [35]. Japan has implemented various forms of work shifts, including day work without night overtimes, nighttime-only shifts, flex time (flexibility regarding when to start and finish work), and work sharing (multiple workers taking charge of one position) [1]. Such systems with various forms of work shifts are lacking in Korea, as Korean policies mainly focus on women in full-time jobs or working standard hours, highlighting the requirement to implement alternative shift forms for rotating shift workers.

Factor 4, “work environment,” represents concerns about transmitting infectious diseases and epidemics that are present in the hospital to their children or harming them in some way, which is consistent with previous reports that mothers are more stressed about being exposed to uncontrolled infections [36]. Nurses who went through the Middle East Respiratory Syndrome outbreak in Korea in 2015 experienced firsthand the risk of infecting themselves, colleagues, and families and expressed concerns about the threat of contagious illnesses [37]. This factor includes items specifically tailored to the nursing profession that are not present in existing tools.

In our study, the correlation between our instrument and the KICCE version of the PSS, to test the criterion validity, was .36. The correlations of the “work shift” (.19) and “work environment” (.22) factors were relatively low. It can be considered to reflect the nature of the nursing profession, which involves special work shifts, such as rotating shifts, holiday shifts, and on-call shifts as well as special tasks such as providing care to patients with communicable diseases.

From the preliminary items, items in the “anxiety and guilt” and “awareness of others' judgment” factors were deleted. First, the items in the anxiety and guilt factor were modified based on the tool developed by Kim and Kang [11], and the factor encompasses items pertaining to anxiety caused by surrogate parenting and feeling sorry for the child. In the past, parents had high levels of parenting stress because of anxiety and guilt for relying on surrogate parenting [11]. In recent years, parents use childcare facilities regardless of the mother's employment status [38], and parenting guilt does not differ according to the mother's employment status [39]. Hence, it seems that anxiety and guilt because of surrogate parenting is not unique to working mothers. Furthermore, guilt felt by working mothers was reported to be associated with the social perception and role conflict in which heavier responsibilities are imposed upon women [40], which may explain why the “awareness of others' judgment” factor that reflects a social perception demanding more sacrifice and responsibility from mothers was deleted along with the “anxiety and guilt” factor. Therefore, this instrument is significant as a measure of parenting stress that reflects modern trends, and additional studies are required regarding this matter.

The PSS for clinical nurses has a different number of items for each factor; thus, the mean score for each factor was calculated to ensure that the total score does not heavily rely on any one of the factors, instead reflecting all concepts of parenting stress identified in the instrument development stage. Furthermore, this enables comparisons of scores by factors to determine which aspect of parenting stress is high. The mean parenting stress among clinical nurses was 11.86 ± 1.55 in our study, and by factors, the mean scores were 2.73 ± 0.54 for “psychological burden,” 2.99 ± 0.52 for “physical and mental fatigue,” 2.82 ± 0.66 for “work shift,” and 3.32 ± 0.59 for “work environment.” The score for the “work environment” factor of parenting stress was the highest, and parenting stress on the environmental dimension was higher than personal. These results are in line with the previous finding that parenting stress among clinical nurses is related to shift work and work environment [5,7]. Although the instruments that have been used in the past to measure nurses’ parenting stress have focused on personal dimensions, such as psychological burden and guilt, the PSS for clinical nurses developed in this study will enable more in-depth research on parenting stress among clinical nurses.

There are some limitations to this study. First, the study findings might not be generalized to all clinical nurses who are mothers of preschool-aged children, as this study only included nurses from general hospitals in two regions of Korea. Second, the analysis could not consider child-related factors, such as character and temperament. Third, the sample size was relatively small to implement pilot tests. Fourth, a test–retest correlation could not be additionally confirmed in reliability verification. Finally, confirmatory factor analysis was not performed for the instrument

developed in this study. Therefore, it is necessary to repeat studies with more diverse and large populations. Further studies to confirm the factor structure are also required.

Despite these limitations, the validated instrument presented in this study can be used to measure parenting stress among nurses raising preschool-aged children to devise specific interventions for this population to lower their parenting stress level. Moreover, this instrument can provide an opportunity to lay a foundation for making relevant policies for this population.

Conclusions

This study aimed to develop and validate an instrument for measuring the parenting stress of clinical nurses who are mothers of preschool-aged children, which considers work shifts and job-specific characteristics. First, the instrument was developed through literature review, in-depth interviews, and content validity testing, and the items were finalized by testing their construct validity, convergent and discriminant validity, criterion validity, and reliability. Finally, the PSS for clinical nurses contained 19 items in four factors: “psychological burden,” “physical and mental fatigue,” “work shift,” and “work environment.” Each item is rated on a 4-point Likert scale from “strongly disagree” (1) to “strongly agree” (4), with a higher mean score for each factor indicating a higher level of parenting stress among clinical nurses. The PSS for clinical nurses developed in this study can be beneficial for assessing the level of parenting stress among clinical nurses who raise preschool-aged children, considering different aspects of stress. By studying factors of parenting stress, interventions can be designed to lower it in this population. Based on our findings, hospital managers will be able to lay a foundation for solving problems related to clinical nurse staffing and career disruption by developing efficient strategies for managing parenting stress among clinical nurses who raise preschool-aged children.

Relevance for clinical practice

In Korea, many nurses raising preschool-aged children choose to quit their jobs. It decreases the quality of patient care and generates problems for hospitals' personnel management. This situation may be related to nurses' parenting stress. The instrument developed in this study will be easy to use at clinical sites and beneficial for assessing the level of clinical nurses' parenting stress considering its different aspects. In addition, the scale can provide a foundation to design efficient strategies for managing parenting stress among clinical nurses and tackle problems related to clinical nurse staffing and career disruption. In particular, active support and interventions by hospitals, nursing associations, and the state are required to reduce stress by identifying which aspects of nurses’ lives are stressful.

Authors’ contributions

K.M.L. and H.S.C. contributed to study design, data collection, data analysis, and writing the article.

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Authorship

All authors listed meet the authorship criteria according to the latest guidelines of the International Committee of Medical Journal Editors, and all authors are in agreement with the article.

Conflict of interest

The authors declare no potential conflicts of interest with respect to the research, authorship, or publication of this article.

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Appendix A Supplementary data

The following is the supplementary data to this article:**Multimedia component 1**Multimedia component 1

Appendix A Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anr.2021.07.001.

Characteristics	Categories	n	%	Mean	SD	Range
Age (years)	≥29	6	3.8			
30–39	123	78.4				≤40
28	17.8				Total	
	36.19	3.36	28.00-43.00	Career (years)	>10	21
13.4				10–15	82	52.2
			<15	54	34.4	
		Total			13.64	3.14
5.00-20.67	Job position	Staff nurse	69	44.0		
	Charge nurse	76	48.4			
Head nurse	12	7.6				Work shift
Rotating 8-hour shift	84	53.5				Rotating 12-hour shift
14	8.9				Mixed	15
9.6				Full-time	44	28.0
			Education level	Associate degree	8	5.1
			Bachelor's degree	109	69.4	

		Master's degree or higher	40	25.5		
	Number of preschool-aged children	1	115	73.2		
	2	38	24.2			
≥3	4	2.6				Living with child
Yes	141	89.8				No
16	10.2				Use childcare facility	Yes
149	94.9				No	8
5.1				Satisfaction with spousal support	Very satisfied	3
1.9				Satisfied	41	26.1
			Dissatisfied	101	64.3	
		Very dissatisfied	12	7.7		

Factor/item	Mean ± SD	Item and total correlation	Communality	Factor loading

Psychological burden				
8. There are times when I feel like my child is falling behind other kids because I am a working mother.	2.52 ± 0.77	.57**	.54	0.74
5. I feel sorry for my child for being left out because I can't actively meet with other mothers.	2.76 ± 0.74	.53**	.61	0.74
3. It's so overwhelming to keep up with the massive parenting information because I am a working mother.	3.08 ± 0.66	.46**	.50	0.73
4. I feel anxious for not having any channels or social parties to obtain parenting information from because I work.	2.90 ± 0.70	.51**	.50	0.71
9. I can't properly discipline my child because I work.	2.54 ± 0.69	.57**	.47	0.64
1. I am not confident whether I can be a good mother while working.	2.60 ± 0.70	.56**	.47	0.63
Physical and mental fatigue				
14. I have inadvertently let out my frustration or gotten mad while taking care of my child.	3.29 ± 0.64	.56**	.67	0.74
18. I'm so exhausted when my child clings only onto me.	3.18 ± 0.63	.31**	.46	0.72
16. I have felt annoyed when my child wanted me to play with him/her.	2.95 ± 0.71	.53**	.59	0.72
30. I feel burdened because the stress I get from patients and colleagues at the hospital affects my parenting.	2.80 ± 0.76	.45**	.46	0.62
21. I'm so burned out at work that taking care of my child at home becomes troublesome.	2.73 ± 0.67	.47**	.41	0.62
Work shift				
25. I feel sorry because I can't be with my child when he/she goes to bed or wakes up due to my shift work.	3.01 ± 0.86	.50**	.83	0.86
26. I feel sorry because I can't spend enough time with my child due to shift work and weekend shifts.	3.10 ± 0.77	.51**	.69	0.83

27. I am worried that the irregular lifestyle due to my shift work will harm my child's health.	2.62 ± 0.84	.70**	.71	0.74
23. I feel sorry because my child's life became irregular due to my shift work.	2.92 ± 0.86	.54**	.52	0.65
28. I feel sorry for my colleagues because I often request my work schedule to fit around my child's schedule.	2.45 ± 0.92	.36**	.45	0.60
Work environment				
32. I have been worried about infecting my child when I come home after providing care for a patient with an infectious disease.	3.36 ± 0.66	.41**	.70	0.84
33. I am worried that my child will be unfairly treated for having a nurse mother when epidemics break out (e.g., MERS, SARS). (Example: Child gets rejected at daycare because he/she is considered a potential source of infection).	3.45 ± 0.68	.30**	.55	0.77
34. I am worried that the toxic substances I encounter at the hospital (e.g., drugs, disinfectants) will be passed on to my child.	3.15 ± 0.72	.52**	.63	0.66

Item no.	Factors				Total
Factor 1: psychological burden	Factor 2: physical and mental fatigue	Factor 3: work shift	Factor 4: work environment	8	.77
.17	.23	.12		5	.81
.26	.12	.24		3	.73
.03	.07	.10		4	.79
.15	.17	.16		9	.75
.20	.28	.21		1	.74
.24	.28	.17		14	.26
.80	.39	.16		18	.06

.72	.07	.11		16	.28
.80	.21	.26		30	.06
.74	.29	.14		21	.23
.75	.19	.15		25	-.01
.36	.84	.38		26	.13
.26	.83	.32		27	.35
.28	.86	.42		23	.20
.37	.78	.28		28	.30
-.06	.64	.03		32	.23
.19	.23	.87		33	.16
.05	.22	.84		34	.18
.30	.46	.85		Number of items	6
5	5	3	19	Eigenvalue	3.28
2.61	2.95	1.90	-	Explanatory power	17.3
13.7	15.6	10.0	56.5	Cronbach's α	.86

Measures	PSS by KICCE	PSSCN total	Factor 1	Factor 2	Factor 3	Factor 4
PSS by KICCE	1					
PSSCN total	.36**	1				
Factor 1: psychological burden	.31**	.69**	1			
Factor 2: physical and mental fatigue	.26**	.64**	.23**	1		
Factor 3: work shift	.19*	.75**	.25**	.30**	1	
Factor 4: work environment	.22**	.57**	.22**	.22**	.36**	1

DETAILS

Subject:	Parents &parenting; Shift work; Womens health; Validity; Work environment; Stress; Questionnaires; Families &family life; Data collection; Children &youth; Literature reviews; Psychiatric-mental health nursing; Nursing; Mothers; Nurses
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Current Status and Associated Factors of Annual Eye Examination Among People with Type 2 Diabetes Mellitus: Using the 7th National Health and Nutrition Examination Survey

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ABSTRACT (ENGLISH)

Purpose

To evaluate the level of annual eye examination (AEE) and identify the associated factors among people with diabetes mellitus (DM).

Methods

A secondary data analysis was conducted using data from the Korean National Health and Nutrition Examination

Survey (2016–2018). A total of 1,465 people with DM (726 men and 739 women) aged ≥40 years were included. The data were analyzed using a complex sample analysis considering a combined sampling weight of 3 years.

Results

In total, 29.5% and 12.0% of men and 36.3% and 24.1% of women underwent AEE and EE at the time of diagnosis of DM, respectively. The AEE rate in men was significantly higher in those who were high school graduates and above (odds ratio [OR] = 1.98), current nonsmokers (OR = 1.82), had ≥10-year duration of DM (OR = 1.75), and use insulin (OR = 2.81), and with a normal body mass index (OR = 1.68). For women, the AEE rate was significantly higher in those aged 40–64 years (OR = 1.76) and with ≥10 years of DM (OR = 1.91).

Conclusion

The AEE rate among people with DM is unsatisfactory and needs to be improved. Health education on the importance of AEE and the application of a reminder or alarm system should be designed to promote AEE to the high-risk population showing lower levels of AEE, including those with a longer duration of DM.

FULL TEXT

DETAILS

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Self-care Experiences of Adolescents with Spinal Muscular Atrophy

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ABSTRACT (ENGLISH)

Purpose

We examined the self-care experiences of adolescents with spinal muscle atrophy (SMA) and their perceptions of the interactions between their body and the environment.

Methods

We interviewed ten adolescents with SMA aged 13–18 years regarding personal care practices. Purposive sampling was conducted in two medical centers in northern Taiwan. Data were analyzed using the Giorgi analysis method.

Results

Four constitutions were identified: (1) limited space for independent development, (2) multiple reconstructions of self-image to improve physical ability, (3) self-care of disease, and (4) developing activity styles to accommodate social culture.

Conclusion

The self-care lived experiences of patients reflect dynamic changes in the body and environment. Self-existence was exhibited by adjustment, practice, and creativity of physical activity to integrate into society. Nursing staff should understand the self-care experiences and needs of adolescents with SMA to develop a database of self-care skills. This study recommended that nursing staff improve their ability to guide patients in taking care of themselves by developing body awareness self-care courses and individual care plans in response to various stages of disability to help patients delay deterioration, realize their physical potential, and promote independence and social development.

FULL TEXT

Introduction

Spinal muscular atrophy (SMA) is an autosomal recessive neuromuscular disorder. Although rare, it has an extremely high mortality rate among infants. This systematic review estimates the incidence to be 1 case per 11,000 live births [1], with approximately 30 newborn babies suffering from this disease annually in Taiwan [2]. SMA can be classified into four types. The onset of Type I SMA is usually before 6 months of age. Patients cannot sit or control their head and most die of respiratory tract infections before the age of two. The onset of Type II SMA is generally between 6 and 18 months after birth, leaving patients unable to stand or walk. Patients with this type of SMA usually die of pulmonary infection in adolescence, while survivors mostly suffer from scoliosis due to persistent muscle weakness, which can affect lung function and cause dyspnea, thus requiring supportive respiratory therapy to maintain life. In Type III SMA, symptoms usually appear 18 months after birth; with this type of SMA, patients experience proximal muscle weakness on the contralateral limb. They can walk, but not far, and some patients require a wheelchair. Finally, patients with Type IV SMA usually only experience muscle weakness in old age [3,4]. Medicine can alleviate the symptoms of SMA and prolong individuals' life spans. However, the complex disease can cause numerous complications that further challenge children with SMA and their parents with care needs, lowering their quality of life [5,6]. Studies in Taiwan covering the past decade suggest that repeat emergency room visits and hospitalization rates among children with neuromuscular genetic diseases are as high as 56.8% and 55.6%, respectively [7]. Orem [8] believes that self-care can help individuals make appropriate, reliable, and effective adjustments to maintain their life, health, happiness, and well-being according to factors influencing their development and living environment. Therefore, if children with SMA can learn self-care activities (e.g., symptom monitoring), their health deterioration may be slowed. Engaging patients in their own self-care can positively impact their physical health, reduce the number of emergency room visits, and improve the quality of life [6,9]. However, there are few articles from 1984 to 2020 on self-care of children with SMA; any discussion on the phenomenon is still obscure. Some studies indicate that children with SMA can manage their symptoms and life, such as resting at appropriate times, eating nutritious food, keeping warm in cold weather, or using aids to complete activities [9–12]. Others, however, assert that children with SMA show poor self-care ability, and patients with SMA types I, II, or III are often less able to perform daily self-care activities, such as dressing, bathing, and moving, when they are more physically paralyzed due to the disease [13,14]. Hence, it is necessary to further explore the self-care experience of children with SMA.

Rivière [15] proved that although children with SMA do not experience sports such as healthy children, they could still achieve space cognition skills during a manual search for hidden objects. They believed that children with SMA could develop their own alternative methods to acquire the ability to perform spatial activities in normal spaces. This also highlights that children can perform self-care behaviors to break through the limitations of their activities. At

present, most documents in Taiwan describe difficulties due to their physical defects in the life of patients with SMA. Yang and Li [16] reported on one school-aged patient's anger and frustration at her peers' rejection because of her physical disability. Hsu [17] found that in addition to being unable to walk, adolescents with SMA also experienced deterioration in their hand muscle strength, making home, school, and self-care activities more challenging for some and impossible for others. They can participate in activities, which are mostly static activities. Interaction with peers is usually good, but peers cannot play with them outdoors as it is difficult for them to go out alone. Some studies have also pointed out that adolescents with SMA need to use wheelchairs or hand aids to help them integrate into school life [18,19]. Merleau-Ponty [20] believes that an individual's behavior is expressed through body intentionality and presented in physical activities. Thus, this theory can help us reflect on our experience from another transcendent perspective.

However, few Taiwanese studies have reflected on the self-care experiences of adolescents with SMA from the Merleau-Ponty's theoretical point of view. For other diseases, significant literature on patients' body response process and self-care behavior produced from their experience of illness and treatment exists. Such studies found that patients have the following response processes and self-care behaviors: perception of physical changes, understanding of physical changes, gradual self-integration of body space and self-rehabilitation ability, regaining control, and self-management of the body [21,22]. As for social participation, Bjorbaekmo and Engelsrud [23] illustrated that children with heart disease can judge the limitations of their physical endurance and use self-care strategies suitable for their conditions to participate in peer activities. Although the earlier mentioned studies are a reference for children's self-care, each disease has its own particularity. Therefore, because patients with SMA are characterized by persistent and irreversible physical degeneration and often alternate between life balance and imbalance, it is necessary to explore in depth how they should respond and adjust their bodies to start the self-care process based on their own perspective.

Methods Study design

This study investigated the self-care experiences of adolescents with SMA using the Husserl phenomenological method. This method can help the researchers obtain evidence regarding the essence of the self-care experience in the interaction between the body and the environment based on the subjective data of adolescents with SMA [24]. In addition, this method also helps researchers reflect on the intersubjective relationship between the participants and others—by uncovering the visible and invisible phenomena in the shared world of intersubjectivity, it reveals the full picture of the self-care phenomenon [24].

Setting and sample

Purposive sampling was used to select participants from two medical centers in Taiwan. The selection criteria were as follows: aged 13–18 years, an established diagnosis of SMA, located in northern Taoyuan County, and no language barriers. The patients and their guardians were asked to sign a research consent form. Ten adolescents participated in this study and completed it.

Ethical considerations

The study was approved by the Ethics Committee of the Institutional Review Board of a medical foundation (Approval no. 201411027RIND). Before the interview, the research process was explained to all the participants and their guardians, both orally and in the written form. The interviews were conducted after all the participants and their guardians completed the written informed consent forms. Measures to promote participant safety included ensuring confidentiality and informing participants of any physical discomfort or emotional risks that might result from participation in this study. In addition, during the study, the researchers paid attention to patients' needs. For example, when a patient reported that he wanted to change his clothes during an interview, the researcher paused the interview and waited until the patient felt comfortable before continuing with the interview.

Data collection

Data were collected through in-depth interviews. Phenomenology emphasizes grasping truth and attempting to describe "phenomena." In this study, the researcher collected data on lived experiences of self-care in the world where the body is presented in the way it is presented. The data were collected from April 09, 2015 to April 08,

2016. The interviews focused on experiences related to adolescents' physical condition and activities. The participants were asked about their physical condition; what the changes in their daily activities they had; what kinds of physical discomfort they had; what experiences they had in taking care of themselves when they were sick; what games they played; what activities they liked; what they did at school, at home, during leisure time, and indoors or outdoors; what they thought of these activities; and how they took care of their bodies during these activities. Therefore, research was held at places convenient for participants, where they could freely express themselves. As such, 9 participants were interviewed at home, while one participant was interviewed in a quiet part of a restaurant. Before each interview, participants were contacted. The researcher explained the purpose of the interview to the participants and assured them of the confidentiality and integrity of the data. The interview was recorded, and important verbal and nonverbal behaviors were also documented with field notes. In addition, important verbal and nonverbal behaviors were documented with field notes. During the interview, the researcher asked for clarifications of unclear details. On average, each participant was interviewed twice. Each interview took about one to three hours. When the data of the tenth subject were collected, data analysis showed that the data were completely saturated, and data collection stopped.

Data analysis

Data analysis was based on the Giorgi analysis method that focuses on a verbatim draft of the interview and is supplemented by interview notes. Giorgi's method involves four steps. First, to gain an overview of the data, this study followed the principle of phenomenological reduction; the contents of the interviews were read repeatedly to fully understand the patients' self-care lived experiences. Second, to determine the meaning units in the data, the first author reread the interview records to determine units of meaning close to the participants' lived experience, to uncover the meaning of unit descriptions, and to determine all relevant phenomena. Third, to interpret participants' natural attitudes as phenomenological sensitive expressions, the authors reviewed the data and classified and generalized the units of meaning to form constitutions and subconstitutions. After continuous discussions with the research team, the first author revised the constitutions and gave a representative example to describe, examine, and explain the constitutions using the language of the participant and to confirm that all data were consistent. During data analysis, to improve the sensitivity of interpretations of the interview data, researchers reviewed existing literature related to the constitutions constructed. This was repeated until the participants' language was congruent with the meaning of the unit, and the information was mainly based on the views of the participants. The authors consolidated the data and translated the daily life descriptions of the participants into professional terms, making all data and terminology consistent. Consolidation of data into universal terms was especially important in reporting to academic groups and presenting the basic structure of the lived experiences of participants. The final step was synthesizing all units of meaning into a consistent statement to provide a general description of the lived experiences of patients and form the essential structure of this phenomenon [25].

The trustworthiness of this study was maintained by adhering to Guba and Lincoln [26] principles of credibility, dependability, transferability, and confirmability. To enhance credibility, use the strategy of long-lasting engagement in the research field with participants. After establishing a relationship with the participants, observe the participation and understand the data to obtain rich data and build trust. To allow for transferability, the researchers provided detailed descriptions, not just the behavior and experiences but their context as well, so that healthcare professionals could understand patient self-care management. Regarding dependability, the interview content was verified with peers, and the analyzed data were reviewed to ensure data consistency. Finally, to improve the research's confirmation, the findings were discussed with the research team. The explanation is not based on the researcher's point of view but on the participants' data to maintain the neutrality of the data. The researcher retained the complete interview data and supporting documents to provide important evidence for future reviews during the analysis process.

Results

Among the ten adolescents, there were six boys and four girls (age range: 13-18 years). Nine participants were unable to walk but continued to go to school. Most of them were the eldest children in their families, but one was the

only child (Table 1).

The lived experiences of self-care as felt by the patients in their body are intertwined with the world through several constructs, such as limited space for independent development, multiple reconstructions of self-image to improve physical ability, self-care of disease, and developing activity styles to accommodate social culture (Table 2). For all subconstitutions, sensing body changes to regionalize body boundaries and coordinating the rhythm of the living body were the most reported self-care behaviors by patients (Table 2). Table 3 is an example that demonstrates how the Giorgi method can be applied to transcript analysis.

Constitution 1: limited space for independent development

Patients assumed that the disorder had branded their body; this was often demonstrated when their bodies could not be exposed to life or social culture. When their condition worsened, they were usually shocked and nervously told their family that they could not control their bodies. As they grew older, their conditions critically deteriorated, and they often felt embarrassed at being unable to perform developmental tasks or socialize with their peers.

Embarrassment caused by disability and the need for assistance

Participants reported that it was impossible to predict where the disorder will affect their bodies. They experienced physical deterioration usually unaccompanied by pain. As such, they commonly discovered their disease when they lost the ability to participate in life activities. They felt that their disability limited their space for activity. However, the disease gradually eroded their ability to take care of themselves, and they often needed assistance, which made them feel very embarrassed, especially in front of their peers.E: “I do not like it when other people feed me at school because many of my classmates are there. I get embarrassed. I feel that it does not matter; it is just a meal. We always need someone to help us, but I feel that no one will like me because there are always adults around.”

Dependency on others for daily life

Patients felt that they needed to wait for the help of others before they could participate in activities. As they grew, they became more incapacitated, making them impatient as they had to wait longer for the help of others. Some participants mentioned that they found that more of the things they used to be able to do on their own now required others’ help, making them feel like they were losing more independence every year.F: “After I could not walk, it was not convenient to go downstairs. I try not to go out. If I want to buy something, I will ask my brother or sister to buy it for me.”

Constitution 2: multiple reconstructions of self-image to improve physical ability

The disorder caused the patients’ bodies to change frequently. When changes occurred, they would test whether their bodies were experiencing a temporary disability or permanent deterioration. They thought that the boundaries of the body were clear and that they could protect themselves from injury during activities. After sensory integration, they readjusted their concept of physical ability. They wanted to develop new behaviors as they grew up. Therefore, they tested and actively trained themselves to perform new physical activities and seek new abilities.

Sensing body changes to regionalize body boundaries

Participants expressed that changes in the shape and function of their bodies often affected their lives. In particular, changes to internal body structure were difficult to recognize from appearance. They needed to be aware of physical or life changes and accepted the changes to set a new range of activities to avoid the crisis of life imbalance. The following were the most common changes: inability to move sideward, inability to sit upright or to raise the head, slowed down writing, and inability to support their hands. Participants believed that being alert to physical changes would prevent the risk of injury during activity.H: “Once, I took a shower, sat in a low chair, then felt pain in my abdomen. I felt a lump under the liver, but later I found out that it was a kidney.”

Patients felt that they were sensitive to changes in body strength, which is often used in daily living.A: “I found that my body had no energy, so I thought about what happened to me. It was my shampoo. It seems that there is a certain ingredient that caused me to temporarily lose strength after washing.”

Coordinating the rhythm of the living body

To complete daily routines independently, participants described the use of certain body parts to help other parts maintain and expand/increase their physical abilities. They used strong hands to help weak hands or feet to move or

take things. They would lower their heads so their hands could comb their hair, clean their faces, or eat. They did not rely on others for activities that they thought they could perform.J: “My hair is difficult to comb, and it hurts me when others help me comb it. I do not raise my hands high; instead, I lower my head so that my hands can comb my curly hair.”

Some participants changed their body positions or internal forces to coordinate body movements. They would move their hands from vertically or horizontally to change positions. When sitting in a wheelchair, they would tilt their upper body to one side to relieve the parts of the lower body that experienced pressure for long periods.C: “My left hand has almost no strength. When I am in bed, my left hand will first rest on my head. If my shoulders are sore, I will force my hands to slide down. If I want to move, I then shake my hands out horizontally.”

Actively training one's body

Participants expressed difficulty in making time for rehabilitation since they were going to school. They would value the strength training of the hands and would require themselves to complete activities of daily living, such as turning over, cleaning the body, and pouring water, to train their ability. They would also take dumbbells or heavy objects to train their hand strength, increasing the weight of items to improve their physical strength. They also used video games to train their fingers to be flexible. In foot training, some people practiced walking, standing, or sliding chairs with wheels.B: “When I wash my hair, I wash it myself. I raise my hands to my head. I think it is a remarkably simple rehabilitation. For me, of course, these are the essential abilities in life, such as pouring water, drinking water, and putting books down. I will do it myself and use it as a form of training.”

Constitution 3: self-care of disease

Patients experiencing diseases often live an uncomfortable life and are unable to perform certain activities. Minor symptoms often turned into severe symptoms and worsening or life-restricting physical conditions. To prevent serious illness, they compressed their abdomen to help expel sputum to prevent serious illness. They had to pay more attention to these activities than their peers. They would also identify external environmental hazards and build physical self-care methods into their daily lived experiences.

Physically understanding proper methods for self-care

They felt that they had to be aware of their physical symptoms. They often ignored small colds, consequently developing possibly life-threatening bouts of asthma exacerbations or pneumonia. They thought sputum usually accumulates in the throat, which is normal for them; however, they needed to determine the location, color, and quantity of the sputum or sore throat to avoid colds. They also noticed pressure sores and changes in the angle of scoliosis. They trained themselves to regulate and relax their breathing to maintain their lung function. When a cold occurred, they used the thickness of the sputum to judge the degree of damage and planned to compress the abdomen or use a sputum clearing machine to help them cough and expel sputum effectively.E: “When the sputum is thick, I try to cough. It was thicker a few days ago, and now it is better and thinner. Judging by its color, a yellow color indicates that there is still an infection. Sputum can be yellow and green. Green sputum indicates a serious condition.”

The patients expressed that they had to plan appropriate ways to maintain their lungs according to life events and time.D: “I attended a lesson at three o'clock and used the incentive spirometer for 20 minutes after class. Then, I was able to suck three balls each time. I turned the incentive spirometer upside down and used the blow ball method. I could only blow two balls.”

Identifying an integrated environmental crisis

The patients expressed that instead of expecting a change in the external environment, it was better to adapt to the environment. Their bodies were more susceptible to illness than ordinary adolescents; an adolescent without SMA could experience illness, but that same illness would manifest more severely and require longer recovery time compared with our participants. Therefore, they would gauge the environment's threat to their body and take precautions to protect themselves better than adolescents without SMA. When a classmate caught a cold, they would wear a mask or ask the classmate to wear a mask. Although they felt that their feet had lost their walking function, they maintained awareness of the weather, protected the comfort of their feet, and avoided poor blood

circulation. They would also keep a distance from colliding adolescents to prevent injury. Some patients stated that having nerve atrophy made them very sensitive to the pain of collision. Occasionally, their activities were limited and could not be avoided immediately; in those cases, they would pay attention to the environment.C: “I get a cold easily; it's so bad! Once, I caught a cold from a classmate and rested at home for four weeks. …. .Now if I see that any of my classmates have a cold, I ask them to put on a mask; otherwise, I wear a mask.”

Constitution 4: developing activity styles to accommodate social culture

Participants reported that they performed differently from their peers in the same activities, such as taking exams or further studies. They would explore items to help their body expand its ability to participate in activities, reach their goals, and gain confidence. For them, interacting with others meant not relying entirely on others for protection. They would adjust their physical activities during dynamic interactions and try to protect others from harm to help themselves and others. They believed that they must develop personal lifestyles to engage in current social activities and connect with the world.

Use of everyday items to compensate for physical activity limitations

Some participants expressed that they would observe and experience the similarities and differences between their activities and others’ activities. They believed that although they could not complete activities as naturally as others, they could use everyday objects or assistive devices to help them complete the tasks. They raised their hands with mats, extended their arms with sticks to fetch something or switch on lights, used ropes to help open and close doors, and modified items to help themselves in class or during exams.A: “At noon, I sat in a wheelchair and used some cushions to raise the tabletop. I can also take a nap on the table with my classmates. Some patients will go to the health room to lie down and sleep, but I do not want to. I feel weird doing that.”

Aside from assistive devices, some participants converted everyday items into more suitable ones for their use. These modified items helped save energy and time.G: “During the exam, others use 2B pencils, but I use 9B. The 9B pencil is darker than the 2B, which saves my strength and time. You should also choose the eraser you think is the fastest and will quickly erase the wrong answer. Cutting it in half will give you eight corners and can erase faster.”

Communion of the intercorporeity form of perceptual interaction

Participants perceived that their bodies were often dependent on family assistance for movement. During passive dependence, the body needed to actively initiate coordination, assist in the movement of the body, and help the family of the patient avoid injury during body movements. They felt that their and others’ bodies needed to work together to achieve a coordinated rhythm in their interactions with each other and that their body was cooperating with others assisting them. Long-term operations are required for physical coordination during these experiences, and changing movements form the tacit operations between the body of the patient and the helper.I: “I did not want grandma to fall too. When I fell, I asked her to help me hold the chair and let me hold it. She made little effort to help me support my body so I could stand up.”

Responding to the body to create a personal entertainment style

Participants believed that they needed to adjust their circadian rhythm to participate in outdoor activities independently with friends. They were aware of when their body was exhausted and how and when to lie down to restore physical strength or continue to participate in activities with their peers. They would also search for social resources and arrange situations that suited their physical conditions, so they could visit bookstores, watch movies, or go to scenic spots with friends.A: “I could go to my favorite singer's concert with my friends. We bought tickets online four months in advance and chose the barrier-free area, close to the door, so it was very convenient for me to come out and go to the toilet. The whole concert was from 2 PM to 10 PM, and I did not leave at all.”

They mediated toilet time and helped themselves independently participate in peer leisure activities.B: “I like to go out alone with my classmates without needing my parents to accompany me. I have trouble going to the toilet because I do not have the strength to shift my hip to the toilet. So I reduce the amount of water I drink and the time I go to the toilet.”

Discussion

This study used a phenomenological approach to explore the self-care experience in adolescents with SMA, according to Merleau-Ponty's perspective [20]. The first result found that participants' perception of the body may be able to drive physical intentionality and produce self-care behaviors. Many symptoms of SMA are invisible to us, and we need to be aware of them through the body. Merleau-Ponty [20] believed that the body is intertwined with life. Therefore, when the disease alters life, it prompts the patient to pay attention to the past physical existence and the appearance of the disease [20]. Initially, the disease often makes the patient feel unfamiliar with the current body. The perception of the body can help them reflect on the physical changes caused by disease and clarify problems in life [22]. When they understand the problem, physical intentionality can target their needs and produce self-care behaviors.

When patients' bodies showed dynamic deterioration, positive strategies, such as sensitivity to their own bodily changes, coordination, training, and so on, may be used to rebuild their boundaries. According to Merleau-Ponty [20], “the formation of the body boundary” means that through the process of interaction between the body and the outside world, “physical self-reflection” presents the whole internal and external localized experience for assimilation into their habitual life. Relevant studies have pointed out that body acceptance, self-identify, and use of self-protection strategies can enhance patients’ reconstruction of body image [27,28]. Therefore, patients should be encouraged to perform life activities to train physical movement, coordination or strengthen their advantages in life to help them accept the body image. This study also found that patients would test whether hand mobility was temporarily or permanently deteriorated. Russo et al [29] asserted that body awareness can help the body perceive changes in its interaction with the environment. As such, participants can reflect on the process of interaction between the body and the environment, which can help them understand the physical threats caused by the environment and generate self-protective behavior to prevent body image disorders.

The parents cannot control the disease. The quality of life for both the adolescents and the parents can be enhanced by making the adolescents responsible for as much of their self-care as they can handle, as the parents' labor and care burdens will only increase over time, which can lead to burnout [3]. In particular, SMA causes internal changes to the adolescents' bodies. Adolescents must still feel themselves and construct appropriate care methods [6]. Although adolescents with SMA cannot cough hard enough to clear sputum from the respiratory tract, they can feel and analyze the signs of the disease and prevent its occurrence. This can help reduce the burden of parental care and affirm the child's care ability. Clinical care usually lacks instructions on self-care practices to guide adolescents with SMA. Therefore, nurses should thoroughly explore self-care behaviors to construct guidelines for disease management. Committed self-care routines can help patients fight their bodies' deterioration and improve their physical well-being.

Concerning “communion of the intercorporeity form of perceptual interaction”, the patients asserted that although they needed others’ help for certain activities, the relationship was interactive. These results were similar to those of Yamaguchi and Suzuki [30] and Haugdahl et al [31]. Through physical interaction with others, the participants can experience and imitate the behavior of others, thereby adjusting and shaping the way of self-care and learning to care for others. This study found that when patients interact with others, sympathy is generated, which drives patients to take meaningful action and develop independent behaviors to maintain the health of others.

Moreover, the participants indicated that their bodies had different means of expression but could participate in social activities with their peers. These results are similar to those of Graham et al [32] and Wintels et al [33]. During the process of interaction, they may achieve the purpose of participation through watching, feeling, and using methods. This study found that interaction with peers can stimulate patients' potential for self-care. In line with other studies, the present study agrees on the importance of peer interaction [34,35]. When the patients’ bodies are placed in a social and cultural structure with peers, they perform development tasks at each stage of the life cycle. In addition, when playing with their peers, they will use social resources or Internet resources to arrange the most suitable environment for their bodies in advance to ensure their personal safety. This process enables patients adjust their physical habits and develop self-care skills.

Practice implications

If patients fear that SMA is eroding their body space and inhibiting independent development, clinical staff should help them understand the stages of development of the individual and the disease and provide information about the patient's prognosis. Given the nature of SMA, patients face multiple changes regarding self-image and physical ability. Therefore, nursing staff should develop physical awareness self-care courses and personal care plans for all stages of disability to help patients delay deterioration and realize their physical potential. Moreover, this course includes awareness of internal and external changes in the body, symptoms, and changes in life and self-care needs. Nursing staff should work with rehabilitation specialists to help patients incorporate physical exercise into activities of daily living to rebuild their self-image and physical ability. Discussions on safe and executable life activities should be held with patients and their parents. In addition, they must be encouraged to perform simple self-care behaviors and increase self-confidence to rebuild their self-image and physical abilities. Nursing staff should facilitate regular exchanges of experiences in self-care skills with patient groups. Because patients are not very mobile, communication software can be set up to increase the timelines of health education and the density of communication and visits. Finally, peer interaction can help adolescents take care of themselves. Plans for improving self-care skills and participating in social activities should be tailored to the adolescents' personality, helping them once again to participate in social culture and group activities.

Limitations

There may be some possible limitations in this study. This study focused on adolescents with Type II and Type III SMA. Therefore, the results of the study cannot be transferred to other types of patients with SMA. In addition, the interview times varied, and they were longer for some participants because the researchers hoped that the participants could maintain a relaxed attitude and have sufficient time to talk. All the interviews were completed based on the comfort of the participants, so the narratives were rich and detailed. However, the researcher will avoid long interview times in the future as they could affect the credibility of the data.

Conclusions

This study used Merleau-Ponty's view of body perception [21] to determine how adolescents with SMA respond to diseases and life changes in their social and cultural contexts and develop self-care processes. The development of self-care behavior is related to the patient's experience of perceiving bodily changes when the patient interacts with others and things. The experience in self-care behavior may be able to encourage patients to regain control of their body and promote the development of self-independence and personality. In addition, this experience can also help patients develop resilience to cope with the transition crisis and adapt to life. Furthermore, the experience can also help patients expand their world. It enables patients to protect themselves when interacting with external things, continue to participate in social activities, and maintain relationships with others, thereby developing more self-care skills, caring and protecting others' behavior, and promoting social development.

This study can help nursing staff to understand the patients’ body, environment, and interaction with others while generating self-care behaviors to enhance disease management and participation in activities and society. It is recommended that nurses not only develop rehabilitation plans for patients performing life activities in the future but also explore the impact of peers on social participation activities.

Ethical statements

This study reports having received funding from the Ministry of Science and Technology, Taiwan (MOST 103 - 2314 - B - 255 - 001 -) and Chang Gung Memorial Hospital (BMRPE04). Ethical approval was given by the National Taiwan University Hospital Institutional Review Board, IRB: 201411027RIND. The authors declare that they have no conflicts of interest. The researchers explained the research objectives and procedures to the participants: safety of the participants was provided by the researchers, including confidentiality and use of pseudonyms to protect participant identities; awareness of any emotional risks that might result from participating in this study.

Author contributions

Bao-Huan Yang: Conceptualization, Methodology, Data collection, Data analysis, Writing- Original draft preparation and Editing.

Chia-Ying Chung: Methodology, Data analysis

Wen-Chin Weng: Methodology, Data analysis
Kao-Wen Lo: Methodology, Data analysis
Yuh-Shiow Li: Methodology, Data analysis, Revise the manuscript

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Conflict of interest
None.

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ID	Age (years)	Gender	Type of SMA	Sibling order
A	16	Men	Type II	1
B	18	Men	Type III	1
C	15	Men	Type II	1
D	17	Men	Type II	2
E	18	Women	Type II	3
F	15	Men	Type III	1
G	16	Women	Type II	2
H	14	Women	Type II	1
I	13	Men	Type III	Single
J	14	Women	Type II	2

Constitution	Subconstitution	Self-care behavior described by the patient
Limited space for independent development	Embarrassment caused by disability and the need for assistance	B.E.G.I.J

Dependency on others for daily life	C.F.J	Multiple reconstructions of self-image to improve physical ability
Sensing body changes to regionalize body boundaries	A.B.C.D.E.F.G.H.I.J	Coordinating the rhythm of the living body
A.B.C.D.F.G.J	Actively training one's body	A.B.E.F.G.I
Self-care of disease	Physically understanding proper methods for self-care	A.B.D.E.G
Identifying an integrated environmental crisis	ACDEG	Developing activity styles to accommodate social culture
Use of everyday items to compensate for physical activity limitations	A.B.E.F.G	Communion of the intercorporeity form of perceptual interaction
F.G.I	Responding to the body to create a personal entertainment style	A.B.E.F.G

Collecting data	Step 2: extracting meaning units	Step 3: transforming meaning units	Contributing meaning units to the constituent

C: I get a cold easily; it's so bad! Once, I caught a cold from a classmate and rested at home for four weeks.Interviewer: Super miserable, huh?C: Yes, I finished the second monthly exam last time.Interviewer: YesC: I became sick for four weeksInterviewer: Well, four weeks in a row!C: I got an infection from my classmates, and I rested at home for four weeks. Now if I see that any of my classmates have a cold, I ask them to put on a mask; otherwise, I wear a mask.	He said he caught a cold easily and his physical condition was terrible! Once, he caught a cold from a classmate and had to rest at home for four weeks. Unable to attend school and participate in activities, he felt miserable. He said he contracted a cold, presumably from his classmates, after finishing the second monthly exam. Normally, students may go to school with a minor cold or return to good health after taking 2-3 days off. However, he thinks that cold can become severe in children with spinal muscular atrophy and they need a long time to recover. This time when he contracted a cold, he could not go to school for four weeks; thus, most of his activities in this semester were confined to his home. Henceforth, whenever he finds that a classmate has a cold, he would ask his classmate to wear a mask; otherwise, he would wear a mask himself.	His weakness makes him vulnerable to respiratory diseases. Once, he caught a cold from a classmate and rested at home for four weeks. Unable to attend school and participate in activities, his physical activity was restricted and he felt miserable being unable to interact with the outside world. He contracted the cold, presumably from his classmates, after he finished the second monthly exam. Normally students can still go to school with a minor cold or can recover from a severe cold by taking 2-3 days off. However, he thinks that since he suffers from spinal muscular atrophy, a small cold could turn into a serious lung disease and take a long time to recover. During the illness, he could not go to the school for four weeks. Most of his activities during this semester were confined to his home. The cold disrupted his daily routine, including studying at school and interacting with classmates, which made him feel miserable. He felt his body was very fragile and prone to even the slightest infections. He realized he had to take proper care of himself to stay safe from diseases. Whenever he sees a classmate with cold, he asks him to wear a mask; otherwise, he himself would wear a mask to	Wear a mask to protect the body Identify the environmental crisis Find ways to take care of oneself

		school.	

DETAILS

Subject:	Patients; Emergency medical care; Quality of life; Behavior; Data collection; Data analysis; Disease; Peers; Interviews; Teenagers; Activities of daily living; Medical research; Qualitative research
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Incidence and Risk Factors of Cardio-Cerebrovascular Disease in Korean Menopausal Women: A Retrospective Observational Study using the Korean Genome and Epidemiology Study data

Jin-Hee, Park; Eun Ji Seo; Bae, Sun Hyoung

ABSTRACT (ENGLISH)

SummaryPurpose

Cardio-cerebrovascular diseases constitute the most common and fatal disease among menopausal women. However, the risk of cardio-cerebrovascular diseases in menopausal women compared to men has been underestimated, with insufficient related studies. Therefore, we examined the incidence and risk factors of cardio-cerebrovascular diseases among Korean menopausal women.

Methods

A retrospective observational study design with secondary analysis was conducted using data from the Korean Genome and Epidemiology Study survey. We used the study’s data of 1,197 menopausal women, aged 40–64 years, who did not have cardio-cerebrovascular diseases at baseline and their related data from the biennial follow-ups over 14 years. Cardio-cerebrovascular diseases were defined as hypertension, coronary artery disease, or stroke. The incidence of cardio-cerebrovascular diseases was calculated per person-years, and multivariate Cox proportional hazards models were used to determine the predictors of cardio-cerebrovascular diseases during the follow-up period.

Results

Of the 1,197 cases, 264 were early or surgical menopausal women. The overall incidence of cardio-cerebrovascular diseases was 18.75 per 1,000 person-years. Early or surgical menopause (HR = 4.32, $p < .001$), along with family history of cardiovascular disease (HR = 1.87, $p = .024$), elevated blood pressure (HR = 1.79, $p < .001$), abdominal obesity (HR = 1.37, $p = .046$), or duration of menopause at the same age (HR = 1.01, $p = .001$), were strong predictors of cardio-cerebrovascular diseases.

Conclusion

Based on the results of this study, it is necessary to identify and closely monitor women with early or surgical menopause for cardiovascular and cerebrovascular diseases prevention. Also, prevention of cardio-cerebrovascular

diseases through blood pressure and abdominal obesity management is vital for menopausal women.

FULL TEXT

DETAILS

Subject:	Population; Menopause; Womens health; Regression analysis; Body mass index; Age; Epidemiology; Hysterectomy; Hypertension; Risk factors; Cerebrovascular disease; Sociodemographics; Cholesterol; Chronic illnesses; Cardiovascular disease; Genomes; Oophorectomy; Estrogens; Lifestyles; Observational studies; Middle age
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Facilitators and Barriers of the Triage Process based on Emergency Nurses’ Experience with the Korean Triage and Acuity Scale: A Qualitative Content Analysis

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ABSTRACT (ENGLISH)

Purpose

Since 2016, the Korean Triage and Acuity Scale (KTAS) algorithm has been applied to the triage process in the emergency departments (EDs) of Korea. This study aimed to investigate the facilitators of and barriers to a well-run triage function based on how Korean emergency nurses perceived the triage process and their experiences with it.

Methods

Data were collected using focus group interviews from June 2018 to January 2019. Twenty emergency nurses were divided into two junior and four senior groups based on their level of clinical experience. All interviews were recorded as they were spoken and transcribed. Data were analyzed using qualitative content analysis.

Results

The participants recognized the need for the KTAS algorithm to efficiently classify emergency patients and were working on it properly. According to the data, we extracted 4 themes and 20 subthemes. Four themes were as follows: (1) awareness about the necessity of triage, (2) facilitators to triage process, (3) barriers to triage process, and (4) suggestions for the establishment and development of triage.

Conclusion

From the findings of this study, various vulnerabilities of the triage process were identified, and solutions were suggested from the emergency nurses’ perspective. Educational, staffing, financial support, and periodic updates of the KTAS are needed to promote the triage process in the future.

FULL TEXT

Introduction

The triage process works as a safety net in an emergency department (ED). More specifically, it is a rapid assessment system that allows medical professionals to quickly prioritize and treat urgent patients, whereas nonurgent patients are vetted, so they can safely wait for relatively minor treatments [1]. The triage process has, thus, led to improved patient safety in the ED, particularly by decreasing mortality rates and reducing overcrowding by ensuring that patients do not stay longer than needed [1–3]. Various scales have been developed to improve triage efficiency, with some depending on the medical environments of individual countries. The world's most commonly used type of triage scale classifies patients into one of five levels depending on their health status. Representative triage scales with tested validity include the Canadian Triage and Acuity Scales (CTAS), Emergency Severity Index (ESI) (USA), Australian Triage Scale (ATS), and Manchester Triage Scale (UK) [4]. These scales have been used as bases for developing new scales in diverse countries. In Korea, for instance, the Korean Triage and Acuity Scale (KTAS) was developed based on the CTAS [5].

In the 2000s, overcrowding in the ED increased in Korea, and as a solution to this, the large hospitals' EDs tried to apply either a proven triage algorithm from abroad or a newly developed algorithm that could work just as well. It was for this reason that the KTAS was developed. This scale fits well with the emergency medical system and medical cost policy of Korea and has been used in EDs throughout the country since 2016 [5]. The KTAS is an algorithm designed to classify patients into five levels based on their symptoms, and emergency nurses are mainly in charge of the triage tasks [5]. The previous studies have primarily been conducted to confirm the reliability and validity of KTAS or verify the effectiveness of an educational program used for improving triage competency [6,7]. However, in addition to the application of the new algorithm, insight into the status of the triage process and improvement points based on the experience of emergency nurses who use the KTAS to perform triage tasks will be needed.

Several factors affect the decision-making processes used by emergency nurses when performing triage. In previous studies, factors influencing the triage process were mainly studied with a focus on barriers, and they identified some of these barriers. For example, differences in nurse competency at the individual level were identified as barriers to be overcome [8,9]. It was shown that these differences in emergency nurses' triage competency levels, which may result in a deterioration in the accuracy of the triage, were caused by variations in their knowledge, assessment skill, experience, and education levels [8]. Janssen [9] reported that individual factors including lack of knowledge, insight, and skills influenced the triage process, and that educational programs were being proposed as a way to solve them and facilitate the triage process. The Delphi study examined the role of triage nurses and emphasized the need for comprehensive educational programs [10]. The Emergency Nurse Association (ENA) in the United States and National Emergency Nurses Association (NENA) in Canada also emphasize that triage competence can be improved through a comprehensive, evidence-based triage education [11, 12].

Emergency nurses have conflicts due to insufficient medical resources, space and patient flow fluctuations, and "triage fatigue" that occur during the triage process, all of which become a barrier [13]. In a study of US emergency nurses, insufficient staffing, language barriers, and burnout were suggested as barriers [14]. Emergency nurses experience more stress than any other ED workers because they have to triage many patients accurately and quickly with limited space and resources [8,13]. Burnout of the nurses in charge of the triage process can lead to mistriage and compromised patient safety [15,16]. Therefore, it is necessary to closely examine the triage process, identify facilitators and barriers, and seek feasible solutions.

Emergency nurses must perform triage based on the unique environments that define the medical systems in their respective countries of operation. In this case, continual research is needed to explore the factors that affect the triage process. In particular, since the KTAS algorithm has been recently applied to the triage process in Korea, studies on this issue can be said to be at the beginning stage. Although previous studies provided insight into triage barriers, the facilitators and barriers emphasized in these studies may differ from those in the medical environment

that the new triage algorithm is being implemented, and the solutions to this may be different. Therefore, a discovery-oriented qualitative study that can derive important topics that affect a triage process using KTAS by comprehensively exploring the experiences of emergency room nurses performing triage tasks is needed. Regarding qualitative research methodology, focus group interviews (FGIs) are useful for collecting high-quality data in a way that allows participants to understand their thoughts and experiences within a relatively short period using the participants' interactions [17]. For a qualitative research exploring the triage process, FGI will be appropriate because by focusing on a specific topic and shared experiences of the participants, it provides insight into the issues under study.

Methods Design

This study implemented a qualitative descriptive research design involving FGIs with emergency nurses to understand their perceptions about the facilitators and barriers to the triage processes from various career perspectives.

Participants and setting

This study aimed to gather diverse and comprehensive opinions about the hospital environment, triage process, and educational curricula provided to medical staff. For this purpose, qualitative interviews, in the form of FGIs with nurses from two EDs that had implemented the triage process, were conducted. The emergency medical system in Korea is divided into regional emergency center (REC) EDs, which are mainly responsible for severe emergency patients in the area, and local emergency center (LEC) EDs, which are mainly responsible for local emergency patients. This study included participants from both types of EDs. The GEC and LEC EDs handled approximately 45,000 and 40,000 emergency patient visits annually, respectively. These EDs classified patients by their emergency symptoms in accordance with the Emergency Medical Act of 1995, but then the LEC introduced ESI in 2000 and started a full-fledged triage process conducted by emergency nurses. As the KTAS became used nationwide in 2016, the two EDs adopted the KTAS algorithm into their triage processes, with nurses being responsible for performing them.

Because the locations of the two hospitals were more than 300 km apart, the focus group consisted of emergency nurses working in each ED for convenience and, as well as to ensure smooth interaction between the participants. The inclusion criteria of this study were (1) an emergency nurse, and (2) must have performed triage within the past month or received triage education. After explaining the study purpose and inclusion criteria to the nursing managers of the EDs, the managers recommended two nurses each (totaling four) who could speak clearly about the triage process. The researcher explained the research process in detail to the recommended nurses, and 18 additional recruitments were conducted following the recommendations of these nurses; a total of 22 eligible participants were assessed. Two of the eligible participants were excluded because there was a conflict between our FGI schedule and their personal schedules. Phone calls and text messages were used in the participant recruitment process. Because triage perceptions may differ according to clinical experience, participant interactions may have important effects on the results of the FGIs [17]. For this reason, participants were divided into senior and junior focus groups. Based on the Clinical Career Development Model of Nurses, novice (1 year of clinical experience) and advanced beginner nurses (2–3 years of clinical experience) were assigned to the junior groups, and competent (4–6 years of clinical experience), and proficient nurses (7 or more years of clinical experience) were assigned to the senior groups [18]. The focus group consisted of six separate groups, with the two junior groups consisting of three participants each and the four senior focus groups consisting of two, three, four, and five participants, respectively, bringing the total number of participants to twenty.

Data collection

Data were collected from June 2018 to January 2019. The interviews were held in a seminar room outside the hospitals to ensure convenience and the anonymity of all the participants. Prior to each interview, the researchers reevaluated the research methods, prepared the research questions to ensure a smooth process, and held discussions about the process as a whole. All the researchers have more than 12 years of clinical experience. The researchers have rich experience and knowledge about the triage process. The first researcher has worked in EDs

for 12 years, 6 years of which she spent performing triage. The third researcher has 1-year experience working as a nursing manager in an ED. In addition, the first and second researchers are experts in qualitative research, and their works have been published in peer-reviewed journals. Considering their expertise in emergency nursing and the study's qualitative research methodology, we attempted to extract and describe the participants' experiences with the triage process in EDs. All FGIs were conducted solely by the first researcher (PA) as the moderator. While conducting the FGIs, the moderator also took memos on the main concepts, and since the FGIs were recorded in a video format, it was not necessary to have an additional researcher to take down field notes. All interviews were conducted using semistructured questionnaires that were prepared in the following order: introductory questions, transition questions, key questions, and ending questions ([Table 1]). All the researchers assisted in creating the interview questions based on the previous literature [8,13,14] and clinical experience. Open-ended questions and prompts were posed at the beginning of each interview to obtain clear information about what participants had experienced. This included questionnaire items such as “Please tell us about your experiences performing triage as an emergency nurse” and “What is triage in the ED?” The formal interview questions were asked in an order progressing from general to specific and positive to negative. Depending on the responses, the moderator checked the interview contents or asked additional questions to maintain momentum. The moderator reviewed the main points of the interview situation and content through debriefing sessions at the end of each interview. One FGI was conducted per group, with each interview ranging from 30 minutes to 1 hour (average of 42.14 minutes). All interviews were recorded in both video and audio format and then transcribed by a research assistant who was a nursing college student with experience in ED clinical practice. The first and second researchers finally confirmed the transcription data while watching the video, which included observing the participants' nonverbal expressions and characteristics such as facial expressions, speech, and gestures. If a transcription was considered insufficient, unclear, or difficult to understand, simple follow-up interviews were conducted via telephone within 10 minutes to ensure the data were sufficiently reliable for analysis. In particular, while analyzing the FGI of the senior group, an additional FGI was conducted within 48 minutes with two participants whose experiences needed further exploration. In this study, data saturation was reached after the 6th FGI: after this point, no new information could be obtained [23].

Data analysis

Collected data were analyzed via the inductive method, following the qualitative content analysis methods proposed by Elo and Kyngäs [19] and Mayring [20] using Nvivo 12.0 and MAXQDA2018 software. Qualitative content analysis is a research method designed to interpret data by checking their structure and meaning to gain better knowledge and understanding of the explored phenomenon [21,22]. The process consists of three stages, including the preparatory phase, organizational phase, and reporting phase (analysis and results) [21,22]. Data analysis begins by transcribing the data on the same day the FGI is completed. In this study, the main analysis process was conducted by scrutinizing transcribed contents and notes taken from the interview. The preparation phase began with the selection of analysis units [19,21]. In this study, meaningful sentences were selected as the analysis unit. Next, the researchers made efforts to understand the data, learn “what's going on,” and get a holistic sense of it [23]. Participants' statements were read in sentence units to understand the data and context better. The researchers familiarized themselves with the data by watching the videos, listening to the recordings, and reading the interview data. At the organizational phase, analysis was conducted using an inductive approach, which started with organizing the qualitative data. This process included open coding, creation of categories, and abstraction. In the organizational phase, the researchers repeatedly read the data to perform open coding for meaningful statements, thus establishing subthemes. The research findings were reported after recategorizing and abstracting the open-coded data. During the generalization and abstraction processes, the researchers continually ensured that meanings were not separated from their contexts by comparing them with the raw data. The researchers also repeated the organizational phase by holding discussions until they were satisfied with their explanations of the research phenomenon. In some studies, a summative check was performed to confirm the results at the final stage of creating an inductive category for the qualitative contents analysis [20]. Additionally, a summative content analysis was

conducted to confirm whether the findings included both junior and senior focus groups' interview data. Using this research method, the frequencies of codes that categorized the themes extracted from the junior and senior focus groups were identified.

Two researchers (first and second) initially performed data analysis to complete the open coding, categorization, and theme identification stages. After that, all the researchers reviewed the contents of the category over two meetings and revised the analysis results. After that, the second researcher further analyzed the summative content analysis, and the researchers confirmed the findings through one meeting and finally completed the data analysis.

Ethical considerations

As this study was conducted with nurses working at medical institutions, the research was approved by Institutional Review Boards (Approval No. CNUH-2018-079). The researchers then provided participants with explanations of the study purpose and all procedures. Participants' willingness to participate was confirmed orally in the first step during the selection process, and the researchers provided written and oral explanations of all procedures and obtained consent from all participants prior to the study's commencement. They were also told that the interviews would be recorded and videotaped to obtain relevant data. Specifically, it was announced that the video would be used only for analysis by the researchers for a comprehensive understanding of the FGI situation. They were told that interview data would be obtained through FGIs, transcribed, stored on computers, and used solely for research purposes, and that they could withdraw from the research at any time. Researchers made sure that the participants understood the study explanation and, if they agreed to the voice and video recording and the use of the study data, were asked to sign a written consent. The FGI began after receiving written consent from the participants. During the FGI, the participants were given numbers (e.g., 1, 2, 3, etc.) as names, to conceal their personal information. To protect privacy related to the data obtained during interviews, all identifying information was anonymized; the files were then encrypted and stored on the researcher's computer.

Rigor

For qualitative data, trustworthiness was based on data credibility, auditability, transferability, and confirmability, as suggested by both Lincoln and Guba, and Sandelowski [[24],[25]]. More specifically, credibility was established by taking video and audio recordings of all the interviews, which were directly transcribed for analysis. To ensure that the analyses and interpretations were credible, data were completed using the “member check” process, meaning that participants were also shown the extracted research findings. Credibility was also assured by obtaining feedback about the analytic results from 1–2 participants of the six groups. All the research procedures were described in sufficient detail to ensure auditability. As themes and extracted raw data were presented in the research findings, transferability was ensured by noting the characteristics of both the hospitals related to the collected data and the general characteristics and clinical experiences of all 20 participants. As the confirmability of any research represents its neutrality, the researchers bracketed all biases and stereotypes found during data collection, analysis, and interpretation.

Results

Twenty nurses were recruited for participation. These individuals were then divided into 6 (30.0%) junior and 14 (70.0%) senior groups based on their levels of clinical experience. In terms of gender and age of the participants, 17 (85.0%) were female, with a mean age of 30 years. The mean length of experience in the ED was 5.26 years, while mean triage experience was 1.65 years. Six participants received official KTAS training and qualified as a KTAS provider. While these participants experienced triage around two to three times per week, they did not act as the main triage nurse during those shifts ([Table 2]).

The qualitative content analysis of the 20 emergency nurses’ FGI data concerning their triage experiences resulted in 442 meaningful statements and 40 extracted codes. Similarities and differences between the codes were then compared, ultimately resulting in 4 themes and 12 subthemes ([Table 3]). Although inductive content analysis was used to develop the themes, which were categorized by open codes, an additional summative content analysis was used to quantify the frequencies of junior and senior focus groups who endorsed each of the codes and themes. Through the findings of the summative contents analysis, it was confirmed that the themes were extracted from both the

junior and senior focus groups ([Table 3]).

Theme 1: Awareness about the necessity of triage Effective system to find and treat urgent patients

All the participants said that triage was an essential system for classifying all patients in the ED as either urgent or nonurgent, thus enabling safe and efficient treatment. Participants also said that the ED only functions properly within the context of the medical system when the triage system works well. They indicated that triage was a crucial factor for the efficient use of limited medical resources, especially when attempting to identify and treat "hidden critical patients" first, as opposed to attending to patients on a "first come, first served" basis.*I think triage is necessary not only from the perspective of the hospital but also from the perspective of the patient because the patient can receive the treatment they need at the right time if triage works well (Senior_FGI5, Participant 15).*

Traffic light in the emergency department that helps resolve chaos

Most participants compared the triage process to "traffic control" or a "traffic light." In this regard, triage helps workers determine the proper order of treatment while resolving any chaos due to situations when the ED is overcrowded with patients. In the ED context, triage works as a signal for separating patients based on those who must quickly be admitted to the resuscitation room and those who can wait for medical staff. Treatment is thus administered through consistent rules. The participants said that anyone in the ED sees the necessity of triage. It is particularly necessary in complicated and crowded situations.*I think I need triage in the ED because many patients visit the emergency room, sometimes 90 to 100 patients come. Since our medical staff cannot see all the patients in order with the same energy, I think that to resolve the congestion, patients who need to be given more attention and those who do not, depending on the patient's triage result, should be distinguished (Junior_FGI1, Nurse 1).The reason that I think we need triage in the ED is that, if we think about the problem of not having triage …. The ED can be very chaotic, and there can be many problems if critical patients and noncritical patients are mixed together. It is easy to think of it like traffic control (Senior_FGI6, Participant 19).*

Theme 2: Facilitators to triage process Personal competence among nurses

The most important facilitator of an efficient triage was personal competence among the nurses. The role of a triage nurse was adopted by veteran shift nurses at each medical institution. The triage nurse plays important roles, both in determining the order of care for ED patients and allocating medical resources. As such, the job is typically filled by veteran nurses with sufficient ED experience and who are well acquainted with local medical resources and hospital systems, meaning they are able to provide proper explanations to patients and their caregivers.

To perform the role of a triage nurse properly, participants said that it was first necessary to obtain basic education on a variety of physical conditions, physiologies, and medicines. They also needed to develop their own intuition through sufficient experience. Furthermore, triage nurses must be skilled enough to find key points in ambiguous complaints, particularly during conversations with the patients themselves. Participants said that triage nurses should also be able to quickly examine health histories via electronic medical records (EMRs), and must complete medical records by quickly typing in both English and Korean.*Triage is performed by the nurse with the most experience in the shift. So, most of the time it is done by nurses with almost 10 years of experience (Junior_FGI1, Participant 2).After calling the patient, you should be able to quickly review their history while the patient enters the triage room. I have to start (history taking) after I know about the patient. (…) Fast typing in Korean and English is important (FGI 5, Nurse 15).*

Triage training program for junior nurses

Participants said that junior nurses benefited greatly from the process of giving cases and finding answers through discussions in the educational program run by the KTAS committee. Some of the participants who were triage educators created similar cases based on the KTAS committee's educational contents. These were used to educate emergency nurses on making appropriate decisions. Participants also said that comparing their own KTAS ratings with those of other KTAS officers helped with continuous education.

Triage-related content was offered through the educational programs for emergency nurses at some medical institutions. Junior participants were, thus, able to prepare themselves before becoming triage nurses. That is, they were able to establish a proper concept of the job through the triage component of the educational program, which

also allowed them to ask senior nurses about the KTAS classifications. Some medical institutions tried to reduce instances of mistriage. For example, an initial training period would be set, in which a new officer would receive one-on-one practical instruction while working with a senior nurse.*That program was very useful… During KTAS training... That is how I trained my juniors. I would make up situations (…) and about four people would perform KTAS together on the same scenario to look at the consistency… I still use this program (Senior_FGI 5, Nurse14). When I started (triage) with KTAS, a senior watched over me and told me I have to do this and that. I did that in the beginning and, afterward, they would only (tell me) if I did something wrong ((Junior_FGI4, Participant 11).*

Firm determination from the emergency department leader

Participants said it was important for the ED leader to exhibit firm determination in the context of triage. They indicated that the effectiveness of triage was dependent on whether the ED leader expressed continual interest in the overall process and made efforts to ensure that patient classifications were functional using the KTAS. They also said that these ED leaders were interested in staffing their shifts so that triage nurses could work properly, which entailed giving them authority to over the triage process.*KTAS became completely settled… because Director B came to the ED… All the things that were not good before disappeared or improved… because he provided feedback about KTAS classifications and respected the triage nurse's decision. Therefore, other staff members followed… I think feedback and attitude are really important (Senior_FGI6, Nurse 18).*

Theme 3: Barriers to triage process Ambiguities in the KTAS algorithm

Participants said that ambiguities in the KTAS created barriers. In fact, all the participants complained that the KTAS classifications for “urgency” did not always reflect reality. Some participants said that it was difficult to provide classifications based on patients’ chief complaints because there was no KTAS track they thought was appropriate. Indeed, some of the proficient nurses said that the KTAS placed internal diseases at a higher urgency level than trauma. Furthermore, triage nurses said that the KTAS classifications were higher than expected for pain.*I think there are times when the KTAS contents are ambiguous. I think that it does not exactly point the patient's symptoms… (Junior_FGI1, Nurse 1).I think… It seems to be talked about as a problem with KTAS… I think there is definitely a gap between trauma and non-trauma. Same pain… for example, when two people with abdominal pain and fractures visit the ED, the KTAS level for abdominal pain is higher than that for trauma... (Senior_FGI5, Nurse 14).*

Lack of awareness about the function and necessity of triage

Among the many patients who visit the ED for urgent reasons, those who lack an understanding of the triage process are sometimes displeased. Some become angry when they cannot immediately see a doctor, especially when individuals who entered the ED after they did are treated first. By contrast, some patients enter the ED with what they or their caregivers believe is a very minor symptom but are still classified as urgent patients through the triage process. In these cases, patients may indicate they do not trust the medical staff and/or show uncooperative attitudes. This was considered a barrier to triage.

In principle, the triage process is classified based on KTAS standards. However, these classifications sometimes have inadequate consequences due to medical staff lacking awareness about the function and necessity of triage. Nonurgent patients are charged an emergency fee, meaning their out-of-pocket payments increase. Some participants said they intentionally increased the patients' priority to avoid patient complaints about the increased medical costs as a triage result. Moreover, they would sometimes alter the results of the triage process to reflect the doctor's request when there were discrepancies between their assessments and KTAS standards.*While I am performing triage, the patients pop in, cursing and yelling, “Why don't you see us in order?” or “Why don't you see me more quickly? Why is this process necessary?” They use disrespectful language, curse, get angry, and even if they do not come in (the triage room), they talk very loudly outside and rush things (Senior_FGI 6, Nurse 19).A baby came in with a fever before he was one year old. He should have been rated at level 4 according to the pediatric fever standards. However, the professor saw him and said, “This baby is young, so please raise the KTAS. Please raise it to level 3 or higher.” Therefore, I did (Senior_FGI3, Participant 8).*

Inadequate triage nurse staffing and triage space in the emergency department

Although medical institutions perceive triage as an absolutely necessary component of the ED, the participants reported that the administrative support and staffing for this process was not sufficient. For example, only one triage nurse is employed for each shift, regardless of how many patients visit the ED. Triage nurses felt pressure because they must handle their jobs alone while on duty. This distinguishes them from other emergency nurses, who are able to work together while giving and receiving help. In this regard, the ED emergency nurses said they are often so inundated with work that they do not have time to visit the bathroom and experience constant pressure when attempting to have their meals. This creates an extremely difficult work environment. Very few nurses can fill this position. This often makes it difficult to perform triage correctly, especially during heavy task loads or overcrowding. Additional staffing is the most crucial area of need when ED crowding is severe. However, hospital managers often set hard limits on the number of workers, and would instruct the nurses to make their own adjustments within the emergency nurse workforce because it did not directly help with billing. Participants also said that an effective triage process was ensured by establishing independent spaces in consideration of patient flow. However, they were often not provided with the practical support needed to perform triage, particularly concerning space and staffing.*While the triage nurse worked 8 hours, or more than 9 hours for night shifts, at least 30 minutes to go to the bathroom, drink water, and eat food should be guaranteed… But there is nobody who can fill this position (FGI6, Participant 17). There are limitations in the system, so we have to invest in the system and, of course, staffing to overcome these limitations. They do not provide support, but they keep telling us to show positive effects, so it is all stressful (FGI5, Nurse 14).*

Lack of staged educational programs for enhancing triage competence

Triage competence entails accuracy and rapidity based on experience and knowledge. However, triage education only focuses on beginners. Triage nurses must therefore work alone when confronting difficulties with the classification process that arise due to ambiguities in the KTAS. This was considered a barrier to the efficient application of triage. In particular, nurses with more than four years of emergency experience felt that it was necessary to receive systematic education designed to enhance competence, but had no way of fulfilling this need. They instead asked senior nurses for answers or simply continued to perform triage despite many related frustrations.*The education that informs cases frequently seen in the ED and various pain-related cases...I think, this education is needed (Junior_FGI1, Nurse 1).As you work as a triage nurse, there is very little chance of getting an education like a beginner. I still want to learn more, so I hope I can spend some time with professionals and people who know the latest updates (Senior_FGI6, Nurse 19).There are some people who are (performing triage) for the first time, but some people like me have done it a lot. People who have a lot of experience get similarly ambiguous (triage) cases. I would like it if these ambiguous cases were summarized and guidelines like “In this case, do triage this way” were reflected a bit more in the education (FGI3, Nurse 9).*

Theme 4: Suggestions for the establishment and development of triage Necessity of various forms of education

Participants said that formal education should be established to develop triage competence. They also expected specific programs for senior or junior nurses. This was believed to be a good way to gradually enhance triage competence. Participants suggested that appropriate training content should be offered for junior nurses to introduce them to the concept of triage and the KTAS guidelines, as well as provide them triage experience based on various practical cases. For senior nurses, they suggested a method of approaching solutions through discussion, with a particular focus on ambiguous cases. Most participants said that simple lectures were insufficient for triage education, instead suggesting that an app or Internet-based program that was not constrained by time or place would be better than a one-time gathering, especially considering the nature of nursing work. They also said that this type of education should be designed to strengthen motivation, and that education would have a more substantial effect if two-way communication were possible.*I think it would be nice to get triage education with an app or something like that. New nurses like me can study alone whenever they need it, perform triages, and score themselves...(Junior_FGI4, Nurse12).If I have to log on to the computer and type my password on the website, it is too complicated and I would have to sit down to watch, right? Then, I would end up not watching it, so I wish there was an easy way to watch it. Not just in the hospital, but I could think to myself, “I'm going to work today. Should I*

watch it for about 10 minutes before I go to use KTAS?" I wish there was a mobile application that I could use… that I could watch on the bus… (Senior_FGI2, Nurses 4, 5, 6).I would rather have a video that shows the patient's complaint, the level they are assigned, and the reasons for it. I think it would be nice to do something like watching a video and clicking on it (Senior_FGI6, Nurse 20).

Periodic update of KTAS algorithm

In order for KTAS to operate effectively, participants in the senior groups stated the need for a stabilization process that could consistently supplement current problems. They said this should involve manuals to help ED staff understand the KTAS more easily as well as regular updates. The KTAS should help reduce chaos in the ED rather than simply working as an administrative patient classification scale.*I hope that the KTAS algorism will be made clearer. It seems like an old standard. Some things do not fit the situation right now (Junior_FGI1, Nurse2).I do not know why they do not make revisions when they publish so many papers or statistics about KTAS. I looked up some papers… Now that we have gathered that much data, I think it is time for a revision. However, they are not revising it and I feel a little… (Senior_FGI5, Nurse 14).*

Appropriate administrative support and compensation

Participants said that practical administrative support would help prevent triage from becoming a process in name only. They also said that effective triage requires efficient staffing and an independent triage room. Furthermore, because only competent emergency nurses should play the role of KTAS officer, they suggested that KTAS could be more stably operated by offering these individuals additional monetary or status-based compensation.*There should be a space for triage, sufficient staffing, and the nurse should also be competent… (Senior_ FGI2, Nurse 4).When nurses are tasked with triage, they are not promoted, but they tell each other that they "got a promotion," While in fact, they had not. Because the salary is the same… and the position and pay grade remain the same… (Senior_ FGI6, Nurse 17).*

Discussion

This is a qualitative study exploring the experiences of emergency nurses in charge of the triage process in Korea, and attempting to view the reality and future directions of this process from the perspective of the practitioners. Through FGIs and qualitative content analysis, the results were derived with three themes for the awareness, facilitators, and barriers of the triage process in Korea, and one theme for the future development direction.

All participants stated that triage was a necessary process for efficient medical treatment in the ED and patient safety. Currently, the triage process, which forms part of almost all EDs globally, began in the early 1800s when wounded soldiers in the war of that era had to be moved to safety and treated according to the urgency of their injuries, and was introduced in US EDs after the 1950s as a way to resolve overcrowding [26]. The triage process was first introduced in Korean EDs in the mid-1990s [27], and is currently being performed using the KTAS, a newly developed algorithm [5]. Today, KTAS is still being used in the triage process in EDs nationwide, and this process is becoming increasingly essential in emergency medical systems for patient safety [5]. Previous studies have reported that most medical staffs agree on the need for a triage process in the ED and state that practitioners' eligibility should be further strengthened, requiring competent nurses to perform triage tasks [11,12,26,28]. ENA emphasizes that because triage is an important decision-making process that affects patient safety, registered nurses who have completed a triage-specific education must perform the triage task [1,11]. In Korea, a medical staff member who has acquired a KTAS provider certificate can perform the triage process [29], and the requirements for performing triage considering the global trend trends may be further strengthened in the future. Most triage tasks are performed by emergency room nurses, so the emergency nurse should recognize the necessity and perform the role with responsibility [11,12].

Through qualitative content analysis, it was found that the competence of emergency nurses in the triage process was a major facilitator. On the other hand, it can be said that the differences in the nurses' competence may act as a barrier to the triage process. Hitchcock [8] reported that differences in knowledge, education level, and experience lead to varying levels of competence among the triage nurses, which may result in triage errors. In a study on the factors that affect triage implementation, the difference in nurses' competence resulting from differences in

knowledge, skills, and insight is considered a barrier, and education, including official training, certification, and testing of knowledge is being proposed as a strategic way to solve this problem [9]. In this study, both junior and senior nurses reported to have attempted to improve their own abilities through education and experience. In particular, through the interviews of the junior group in this study, it was possible to confirm how beginners who want to start triage task adapt to the triage process. Such efforts to enhance personal capacity can lead to facilitators of triage process. The ENA in the United States and NENA in Canada also emphasize that triage competence can be improved through education targeted at various diseases, physical assessment skills, and the critical thinking needed to make accurate clinical judgments [11,12,30]. Therefore, competency-based systematic education will be needed to reduce the competency gap of emergency nurses and develop the triage process.

In this study, triage education was identified as a facilitator, barrier, and a suggestion for future development. Regarding the content of triage education, participants revealed different needs depending on their level of experience. In this study, the junior nurses group said they wished to learn more about the concept of triage, KTAS algorithm, and standardized cases. ENA has already stated the need for not only various qualification requirements including advanced cardiac life support certifications but also triage-specific educational programs [11,12]. Indeed, ENA provides individual educational content for triage nursing, including instructions for dealing with adult and pediatric patients, while the CTAS education program consists of information on its general concept, the process of application, the role of the triage nurse, case studies, and online educational discussions [31,32]. In Korea, nurses must complete 4.5 hours of regular education hosted by the KTAS committee. They must also pass both the pre- and posttests for triage qualification [29]. Here, training content is similar to the CTAS program, in that the text defines triage, provides details on related procedures, and offers a conversational description of a patient visit in which nurses give a KTAS classification [29]. In previous studies, educational programs were mainly comprised of content requested by junior nurses. In this study, emergency nurses who were rated as senior nurses stated the need for continued education to understand KTAS updates and ambiguous cases. Further, triage requires continual education rather than one-time learning. For this reason, quality improvements are ensured for emergency nurses when institutions offer various triage programs that are tailored to the specific educational needs of senior nurses in the form of certification renewals and/or supplemental education.

Participants offered a variety of opinions about educational designs and methods. Participants preferred two-way discussions and repetitive and convenient learning methods rather than one-time group training conducted only with lectures. The junior nurses said that it was useful to perform triage using KTAS on real patients and receive 1:1 feedback from seniors. In terms of training implementation, there are some points need to be considered. The method of practicing triage on actual ED patients was thought to pose safety risks, especially when triage nurses were not fully qualified. In addition, 1:1 training with on-site preceptors may be less harmful in terms of patient safety, but this is only possible in small groups, meaning that efficiency may ultimately be reduced when considering the time and costs of training. Therefore, a method using simulation or various content is preferred over real field education [33]. Among the alternatives proposed in this study, a more realistic and effective method may be to utilize various content forms to increase experience through repeat learning. A variety of new elements and methods have recently been implemented to enhance triage education, including video clips and podcasts [7,32]. Reports have shown that these factors improve decision-making in the triage context [7]. In line with the rapid development of indirect and remote education technologies, it may also be useful to establish a triage-specific educational program that implements various forms of content through information and communication technology.

Nurse competency and education programs are primarily focused on the triage accuracy. The goal of the educational program is to learn the KTAS algorithm to prevent triage errors and to help make accurate decisions [34]. However, in the triage process, speed is just as important as accuracy. In this study, participants provided practical opinions, not only concerning accurate decision-making but also about the need for quick processing during tasks such as searching for EMR and typing. These triage facilitators were extracted based on the direct experiences of triage nurses. While previous studies on this issue have solely focused on accurate decision-making, this study also revealed practical ways to improve triage from a more realistic perspective. Therefore, when developing a triage

training program, it should include content focused on improving practical work speed along with training for accurate decision-making.

In this study, the lack of awareness of patients and medical staff about the necessity and function of triage served as a barrier to the triage process. Doctors' lack of awareness about the necessity of triage, along with friction between nurses and patients have been reported as barriers to the triage process [9,13,14]. In general, most patients visit the emergency room because they feel that their condition is urgent, so they expect to be treated first on arrival. Therefore, for the smooth running of the triage function, resolving the discrepancy and friction between emergency nurses and patient should be prioritized. To reduce the stress and burnout experienced by emergency nurses due to such friction, it is necessary to spread awareness that the “first come, first served” rule does not apply in the ED. The methods for improving cooperation among medical staff include the involvement of doctors in the implementation phase, organization of special meetings, and the education of doctors of other disciplines about triage by ED-doctors [9]. This will help medical staff to recognize the importance of the triage process, respect each other's opinions, and spread a culture of cooperation.

In this study, the perspective of the medical institution was extracted to highlight facilitators and barriers to the smooth operation of the triage function in EDs. In this regard, facilitators include the ED leader's determination to improve the system. In situations of overcrowding in the ED and insufficient interest/support from the leaders or hospital management, many nurses experience burnout due to heavy workloads, with some eventually considering triage a burden. This constitutes an important barrier. Emergency nurses are known to experience burnout in high-stress environments [13]. This is very important, as reports have shown that burnout can severely impact patient safety [15,16]. To prevent burnout, hospitals should provide additional nurse staff. A previous study examined how emergency nurses were staffed by analyzing routine jobs, thus finding many barriers to triage, including overcrowding, pressures related to mistriage, and the urgent need to identify patients with limited time; triage nurses said their experiences in this special position were not sufficiently reflected [35]. Further research into these nurse staffing issues should provide evidence to help establish appropriate workforce numbers from the perspective of hospital executives. Future studies should therefore research how effective staffing for emergency nursing is accomplished, particularly focusing on the special stress and pressures that triage nurses experience. This study's findings clearly show that institutions should have standards to ensure proper staffing. Further, appropriate compensation should be given to triage nurses, as these individuals are tasked with making important decisions about patient safety under high stress.

In this study, factors related to the KTAS algorithm were reported as triage barriers. Specifically, participants said that the scale was both complicated and ambiguous, and that updates were needed to reflect the actual needs of front-line workers. Various studies have investigated the development and application of the KTAS, particularly regarding how mistriage results are reported in relation to pain standards, and most especially regarding the revision of the triage scale [6]. In this study, participants discussed cases in which the patient's chief complaints were not reflected by symptoms listed in the KTAS. They also related experiences in which mistriage was related to pain. The ambiguities and complexities reported as triage barriers may be reduced when these findings are accumulated and reflected in KTAS updates.

Despite these informative findings, there may be limitations to their generalizability because only facilitators and barriers to triage were identified based on the experiences of emergency nurses in Korea who used the KTAS. However, these limitations are difficult to avoid since any emergency medical system will reflect unique national characteristics. It is still possible to conduct in-depth comparisons with results from studies in countries that have developed and applied similar triage scales. As the KTAS was developed based on the CTAS model, it should particularly be possible to compare this study's findings with research findings from several Asian countries that use similar triage scales, including the TTAS in Taiwan and Japanese triage and acuity scale, which was also developed based on the CTAS.

Conclusions

To ensure effective triage, professionals must first understand the realities of the triage process, particularly from the

perspectives of nurses, who are the main decision-makers. In this study, various vulnerabilities of the triage process were identified, and solutions were suggested from the perspective of emergency nurses. Educational, staffing, financial support, and periodic updates of the KTAS will help advance the triage process in the future. The findings will be useful both in developing various effective educational programs and KTAS renewal and establishment policies on triage process.

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Conflict of interest

The authors declare that they have no conflict of interest.

Introductory question
•Please tell us about your experiences with performing triage as an emergency nurse.
Transition questions
•What is triage in the EDs?•How process do emergency nurses perform triage?
Key questions
•What factors or activities influence the triage process?•What factors or activities help the triage process in the EDs?•What are the factors that interfere with the triage process in the EDs?•How desirable is it for triage to move forward in the future in your opinion?
Ending statements
•We have talked about the facilitators and barriers to the triage process in the EDs.•(2~3 minutes after summary) What I've been talking about is an adequate summary of our conversation today.•Please feel free to add anything that you think is necessary to improve triage process.

Characteristics	Junior group (n = 6)	Senior group (n = 14)	Total (N = 20)
n (%) or Mean ± SD	n (%) or Mean ± SD	n (%) or Mean ± SD	Career level
Novice	3 (15.0)	0 (0.0)	3 (15.0)
Advanced beginners	3 (15.0)	0 (0.0)	3 (15.0)
Competent	0 (0.0)	6 (30.0)	6 (30.0)

Proficient	0 (0.0)	8 (40.0)	8 (40.0)
Gender			
Women	5 (25.0)	12 (60.0)	17 (85.0)
Men	1 (5.0)	2 (10.0)	3 (15.0)
Age	25.17 ± 1.17	32.07 ± 4.28	30.00 ± 4.85
Education level			
Diploma	0 (0.0)	4 (20.0)	4 (20.0)
Bachelor's degree	6 (30.0)	8 (40.0)	14 (70.0)
≥Master's degree	0 (0.0)	2 (10.0)	2 (10.0)
Experience in nursing (year)	2.13 ± 1.27	8.63 ± 4.08	6.69 ± 4.60
Experience in the ED (year)	2.13 ± 1.27	6.59 ± 2.11	5.26 ± 2.81
Experience with triage (year)	0.83 ± 0.98	1.99 ± 1.46	1.65 ± 1.42
Type of ED			
REC	6 (30.0)	4 (20.0)	10 (50.0)
LEC	0 (0.0)	10 (50.0)	10 (50.0)

Theme	Subtheme	Frequencies

Junior focus group (n = 2)	Senior focus group (n = 4)	Total focus group (N = 6)	Awareness about the necessity of triage	•Effective system to find and treat urgent patients
2	9	11		•Traffic light in the ED that helps resolve chaos
6	5	11	Facilitators to triage process	•Personal competence among nurses

7	49	56		•Triage training programs for junior nurses
5	18	23		•Firm determination from the ED leader
-	15	15	Barriers to triage process	•Ambiguities in the KTAS algorithm

15	52	67		•Lack of awareness about the function and necessity of triage
4	34	38		•Inadequate triage nurse staffing and triage space in the ED

11	50	61		•Lack of staged educational programs for enhancing triage competence
7	19	26	Suggestions for the establishment and development of triage	•Necessity of various forms of education

10	38	48	•Periodic update of KTAS algorithm	2
24	26	•Appropriate administrative support and compensation	1	39

DETAILS

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Chang, H. E., & Jeong, S. (2021). Male nurses' experiences of workplace gender discrimination and sexual harassment in south korea: A qualitative study. Asian Nursing Research, 15(5), 303-309. doi:https://doi.org/10.1016/j.anr.2021.09.002

PurposeThe purpose of this study was to explore male nurses' experiences of workplace gender discrimination and sexual harassment in South Korea.MethodsPhenomenological qualitative methodology exploring male nurses' experiences was employed to collect data, and thematic analysis of the data was conducted. Research subjects were recruited by convenience and snowball sampling. Ten male nurses participated in individual in-depth interviews via mobile phone. Data were collected from June 15 to July 24, 2020.FindingsTwo themes were extracted that described male nurses' experiences of workplace gender discrimination and sexual harassment. In the first theme, "facing gender discrimination from various dimensions," nurses' thoughts and feelings regarding gender discrimination from various sources were expressed. The second theme, "experiencing sexual harassment at work as a man," presented experiences of sexual harassment as a male nurse and difficulties in being recognized as a victim.ConclusionGender discrimination and sexual harassment experienced by male nurses stem from a wide range of socio-cultural factors, ranging from individuals to organizations, and institutions. Therefore, this problem requires a correspondingly broad approach for improvement, such as making efforts to avoid classifying certain roles according to gender, developing new standards considering the specific experiences of men as victims of sexual discrimination and sexual harassment, and continuing training to increase social sensitivity and interest in the harm suffered by minorities in society.

Oh, J., & Ahn, S. (2021). Effects of nurse navigators during the transition from cancer screening to the first treatment phase: A systematic review and meta-analysis. Asian Nursing Research, 15(5), 291-302. doi:https://doi.org/10.1016/j.anr.2021.10.001

PurposeImplementation of nurse navigators during cancer screening to the first treatment visit may facilitate early diagnosis and treatment. This study aims to demonstrate the evidence of the effects of nurse navigators during cancer screening in the first treatment phase.MethodsEleven electronic databases were searched, including PubMed, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, Web of Science, ScienceDirect, PsycINFO, KoreaMed, KISS, RISS, and DBPIA. The final search was completed in August 2021. Two reviewers independently screened and selected studies, extracted data, and conducted a quality assessment. Data to evaluate the effects of nurse navigators was analyzed through meta-analysis and narrative summary. Subgroup analyses were performed.ResultsA total of 16 studies was included. With low to moderate quality of evidence, nurse navigators had favorable effects on improving the timeliness of care during screening during the first treatment visits (MD = 20.42, 95% CI = 8.74 to 32.10, p = .001). Additionally, 13.0% to 45.0% of nurse navigated patients were more likely to complete cancer care services, although insignificant effects were observed. Study participants from individual studies reported a high satisfaction to the nurse navigators. Subgroup analyses indicated that nurse navigators working as key members in multidisciplinary programs had the greatest effect on reducing waiting times.ConclusionNurse navigators improve cancer patient outcomes by providing more timely care. Additionally, nurse navigators have the substantial potential to increase completion rates to cancer care services and patient satisfaction. For facilitating multidisciplinary care, the use of nurse navigators is highly recommended in the future.

Im, M., & Oh, J. (2021). The development and validation of a perceived nursing support scale for mothers of preterm infants. Asian Nursing Research, 15(5), 317-326. doi:https://doi.org/10.1016/j.anr.2021.10.002

SUMMARYPurposeMany studies have maintained that nursing support is necessary and essential for mothers of preterm infants; however, the perceived nursing support for mothers of preterm infants has not been sufficiently measured. This study aimed to develop a perceived nursing support scale for mothers of preterm infants (PNSS-MP).MethodsThe preliminary items of the PNSS-MP were developed through a literature review and in-depth interviews with mothers of preterm infants. Content and face validities were assessed by experts and mothers of

preterm infants. A pilot study was conducted to confirm the feasibility and comprehension of the scale. To validate the PNSS-MP, 223 mothers of preterm infants were surveyed. Exploratory factor analyses were performed to confirm construct validity. Convergent and discriminant validities were analyzed using a multitrait-multimethod (MTMM) matrix. Reliability was tested by calculating Cronbach's α and performing split-half testing.ResultsThe PNSS-MP consisted of 27 items and was categorized into five factors, explaining 65.3% of the total variance. The factors were named: "baby care support" (7 items), "mental care support" (6 items), "maternal role support" (6 items), "introducing resources support" (4 items), and "information delivery support" (4 items). The overall reliability of the scale was .95.ConclusionThe PNSS-MP adequately reflected the neonatal intensive care unit (NICU) in South Korea. Additionally, the PNSS-MP proved relatively valid and reliable; therefore, it can be used to measure nursing support in the NICU.

Kim, M., Nam, E. S., Lee, Y., & Hyun-Ju, K. (2021). Effects of lavender on anxiety, depression, and physiological parameters: Systematic review and meta-analysis. Asian Nursing Research, 15(5), 279-290. doi:https://doi.org/10.1016/j.anr.2021.11.001

SummaryPurposeThe recent evidence suggested substantial anxiolytic efficacy of lavender. The aim of this study was to examine the efficacy of lavender for anxiety, depression, and physiological parameters and to elucidate the differential effects of lavender on anxiety and depression by study characteristics.MethodsA systematic review and meta-analysis was performed following the PRISMA guidelines. We searched PubMed, Embase, Cochrane Library, Web of Science, and Cumulative Index of Nursing and Allied Health Literature databases for randomized controlled trials investigating the efficacy of lavender on anxiety, depression, or physiological parameters in humans. We assessed the risk of bias within studies with the revised Cochrane risk of bias tool for randomized trials. We used random effect model to estimate the average effect and computed bias-corrected standardized mean difference as effect size metric, Hedges' ĝ for all outcomes.ResultsLavender was superior to placebo or no treatment in reducing anxiety (Hedges' ĝ = −0.72, 95% confidence interval CI] −0.90 to −0.55, p value <.001), depression (Hedges' ĝ = −0.43, 95% CI, −0.59 to −0.27, p value <.001), and systolic blood pressure (Hedges' ĝ = −0.23, 95% CI, −0.41to −0.05, p value = .01). The moderator analysis by meta-regression indicated that route of administration accounted 6.5% (p value = .187) for the heterogeneity in anxiolytic effects, sessions of treatment accounted 13.2% (p value = .055), and participants' health state accounted 8.9% (p value = .131) for the variance in anxiolytic effects.ConclusionLavender aromatherapy showed substantial effect in reducing anxiety and depression, and sessions of administration increased the anxiolytic effects. The effects on physiological parameters showed small with inconsistent significances and randomized controlled trials on the effect of lavender on depression were scarce. Future trials on depression and physiological parameters are recommended, and increasing the sessions of administration is recommended.

Hur, M., & Hee-Soo Choi. (2021). Effects of a thermoelectric element band on venipuncture-associated pain and anxiety: A randomized controlled trial. Asian Nursing Research, 15(5), 337-344. doi:https://doi.org/10.1016/j.anr.2021.12.003

SummaryPurposeVenipuncture is an invasive procedure for diagnosis and treatment, which is often attributed to pain and anxiety. In this study, a thermoelectric element (TEE) band was developed to apply heat therapy (40~45°C), cold therapy (0~10°C), or thermal grill illusion (TGI) therapy (40~45°C, 0~10°C) to cause an illusion of pain by simultaneously applying heat and cold. This band was subsequently used to investigate its effect on patient pain, anxiety, and satisfaction.MethodsThis was a randomized controlled study. Participants, who were to undergo venipuncture, were randomly assigned to the heat therapy, cold therapy, TGI therapy, or control groups. Each group had 30 participants. The interventions were employed for 10 seconds during venipuncture, and the pain, anxiety, and satisfaction were measured before and after the procedure.ResultsSubjective pain, anxiety, and physiological responses after TEE band intervention were not significantly different between the four groups. However, there was a significant difference in satisfaction (F = 4.21, p = .007) between the four groups, and the cold therapy group showed the highest satisfaction.ConclusionIn this study, when heat, cold, and TGI therapy were applied with a TEE band, pain and anxiety relief effects were not confirmed, but satisfaction was high. TEE band is a newly developed product that can easily apply hot and cold treatments without using ice packs or hot water packs. Further studies

with various individual characteristics of chronic pain or repeated venipuncture are warranted to evaluate the effect of TEE.

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Kang, J., Hong, J., & Lee, Y. (2021). Development and feasibility test of a mouth contactless breathing exercise solution using virtual reality: A randomized crossover trial. Asian Nursing Research, 15(5), 345-352. doi:https://doi.org/10.1016/j.anr.2021.12.002

SummaryPurposeThe purpose of this study was to develop a novel mouth contactless breathing exercise solution based on virtual reality (VR), and to test its feasibility.MethodsWe developed the Virtual Reality-based Breathing Exercise System (VR-BRES), a self-regulating biofeedback breathing exercise with gaming characteristics and a soft stretch sensor. The feasibility and efficacy of the VR-BRES prototype were investigated through a randomized crossover trial. Fifty healthy adults participated in the trial, and their respiratory parameters and user evaluation of the VR-BRES were compared with conventional deep breathing (CDB) exercises.ResultsThe respiratory parameters, forced vital capacity ($Z = 4.82, 4.95$, $p < .001$), forced expiratory volume in one second ($t = 6.02, 6.26$, $p < .001$), and peak expiratory flow ($t = 5.35, 5.68$, $p < .001$) were significantly higher during breathing exercises using the VR-BRES. User evaluation was also significantly higher for the VR-BRES in terms of efficiency ($Z = 3.86$, $p < .001$), entertainingness ($Z = 5.00$, $p < .001$), and intention to use ($Z = 3.22$, $p = .001$) compared to CDB.

However, there was no difference in convenience between the two methods (Z = −0.90, p = .369).ConclusionThe VR-BRES has the potential to be an efficient breathing exercise solution. We recommend a clinical study that evaluates the effects of the VR-BRES for a certain period of time for people who need breathing exercises.

Choi, Y., & Hye, Y. A. (2021). Developing and evaluating a mobile-based parental education program for preventing unintentional injuries in early childhood: A randomized controlled trial. Asian Nursing Research, 15(5), 329-336. doi:https://doi.org/10.1016/j.anr.2021.12.001

SummaryPurposeThis randomized controlled experimental study verified the educational effect of a mobile-based parental education program for preventing unintentional early childhood injuries.Design and MethodsFrom August 2019 to September 2019, 167 participants were recruited from parenting portal sites and randomly assigned to an e-learning group (n = 59), an electronic document distribution (EDD) group (n = 53), and a control group with no intervention (n = 55). Participants self-reported data regarding their safety knowledge and behavior before and after the experiment. Each intervention group received an e-learning program and electronic educational documents for two weeks and a satisfaction survey. Using an ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, the relevant e-learning contents were developed with the Storyline 360 program. The collected data were analyzed using 1-way ANOVA, 2-way ANOVA, and independent t-test.ResultsResults were as follows: (1) Postintervetion, no significant differences regarding safety knowledge were observed between the e-learning group, EDD group, and control group. (2) Postintervention, statistically significant differences regarding safety behaviors were observed between the three groups: 3.52 ± 0.28 (e-learning group), 3.51 ± 0.28 (EDD group), and 3.32 ± 0.25 (control group) (F = 10.091, p < .001). (3) No significant differences regarding education-related satisfaction were observed.ConclusionsThe mobile-based educational program for preventing unintentional injuries positively affected safety behavior in this study. Mobile-based parental education programs could contribute toward effectively preventing unintentional injuries in early childhood because many parents can use these without time and space constraints.

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